MONTHLY WEATHER REVIEW.

(GENERAL WEATHER SERVICE OF THE UNITED STATES.)

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WAR DEPARTMENT,

OFFICE OF THE CHIEF SIGNAL OFFICER,

DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

INTRODUCTION.

Meteorological data received at this office for the month of March have been carefully examined, and a general summary of the several meteorological elements is given below with accompanying charts. That part of this REVIEW descriptive of the weather conditions of North America during the month of March, 1882, is based upon observations taken at more than seven hundred stations, so distributed as to furnish trustworthy records of atmospheric phenomena occurring in the United States and British America between the twenty-fifth and fifty-fifth parallels of latitude.

In comparing the weather conditions which are the subject of this REVIEW with those of the corresponding period of previous years, the most noticeable features are:

First: the excessive temperature over the mean temperature of March of previous years, in all districts east of the Rocky Mountains, and on the North Pacific coast, where the excess in Oregon and Washington Territory ranged as high as 7° above the mean for the month.

Second: the excess of rainfall in the central Mississippi, the Ohio valley and Tennessee, where the rainfall was greatly in excess during the previous month, thus causing a continuation of the destructive floods in the lower Mississippi river and its tributaries, where the water has risen in many places to a higher stage than ever before known.

Third: the slight excess of rainfall in southern California, which, when considered in connection with the rainfall of the preceding month, is favorable for the agricultural and grazing interests of that region.

In considering that portion of THE REVIEW referring to International Meteorology, the most marked features are the extreme high barometer and unusually cold weather that prevailed in the eastern hemisphere during January, 1880. The chart of areas of low barometer for April, 1880, accompanying this REVIEW exhibits the movements of forty-three barometric minima, or a larger number than previously traced on any other chart of this series.

In preparing THE REVIEW the following data have been used, viz: the regular tri-daily weather charts, containing the data of simultaneous observations taken at one hundred and thirty-five Signal Service stations and fifteen Canadian stations, as telegraphed to this office; one hundred and ninety monthly journals and one hundred and seventy monthly means from the former, and fifteen monthly means from the latter; two hundred and eighteen monthly registers from Voluntary Observers; fifty-eight monthly registers from United States Army Post Surgeons; Marine Records; International Simultaneous Observations; Marine Reports through the co-operation of the New York Herald Weather Service; abstracts of Ships' Logs, furnished by the publishers of "The New York Maritime Register"; monthly reports from the local weather services of Iowa, Nebraska and Missouri, and of the Central Pacific railway company; trustworthy newspaper extracts; special reports.

BAROMETRIC PRESSURE.

The distribution of mean atmospheric pressure over the United States and Canada, is shown by the isobarometric lines, (in black) upon chart ii. The area of lowest mean pressure occupies the regions northeast of New England and the area of high pressure extends over the southern states and the Rocky mountain regions, as in the preceding month. The barometer has fallen about .05 of an inch in the southern states, where the isobar of 30.10 corresponds with that of 30.15 of February. The pressure has increased .05 of an inch on the North Pacific coast, and has diminished .05 of an inch in southern California.

The low area of 30.00, which was central north of the lake region has apparently moved to the northeast and beyond the limits of the stations of observation. The pressure has remained nearly stationary at the stations between the Mississippi river and the Rocky mountains.

DEPARTURES FROM THE NORMAL VALUES FOR THE MONTH.

Compared with the means of previous years, the pressure is slightly above the normal in the southern states and the lake region. It is also slightly above the normal in southern California, and about .1 of an inch above, on the North Pacific coast. Compared with March, 1881, the barometer is about .3 of an inch higher in New England; from .15 to .25 of an inch higher in the southern states east of the Mississippi, and about .2 of an inch higher in the lake region. On the Pacific coast, the pressure is .1 of an inch higher at San Francisco than in March, 1881.

BAROMETRIC RANGES.

The range of pressure for the present month has varied from .2 of an inch to 1.48 inches, the least range being at Havana, and the greatest range at Alpena. The range of barometer increases with the latitude, and from the coast toward the interior of the continent. In the several districts, the barometric range has been as follows:

New England: 1.42 inches at Burlington; 1.18 inches at Springfield; and .97 of an inch on the summit of Mount Washington.

Middle Atlantic States: 1.17 inches at Williamsport; 1.16 at Washington; and 1.02 inches at Lynchburg.

South Atlantic States: .62 of an inch at Jacksonville; 1.00 inch at Kittyhawk; Florida, .31 of an inch at Key West; .42 of an inch at Punta Rassa; and .54 of an inch at Cedar Keys.

East Gulf States: .65 of an inch at Port Eads; .79 of an inch at Montgomery.

West Gulf States: .75 of an inch at Castroville; .99 of an inch at Shreveport; 1.01 inches at Little Rock; and 1.14 inches at Fort Gibson.

Ohio Valley and Tennessee: .83 of an inch at Knoxville: .91 of an inch at Memphis; 1.01 inches at Cincinnati; and 1.16 inches at Pittsburg.

Lower Lake Region: 1.24 inches at Toledo to 1.40 inches at Oswego.

Upper Lake Region: 1.17 inches at Chicago to 1.35 inches at Duluth; and 1.48 inches at Alpena.

Upper Mississippi Valley: 1.08 inches at St. Louis; and 1.27 inches at St. Paul.

Missouri Valley: 1.29 inches at Leavenworth to 1.30 inches at Yankton.

Extreme Northwest: 1.30 inches at Moorhead to 1.38 inches at Ft. Buford.

Northern Slope: 1.17 inches at Fort Keogh to .76 inch at Cheyenne; 1.11 inches at Fort Assinaboine and .78 of an inch at Helena.

Middle Slope: .81 of an inch at Denver; and 1.05 inches at Dodge City.

Southern Slope: .66 of an inch at Stockton; and .96 of an inch at Ft. Sill.

Northern Plateau: 1.17 inches at Umatilla to .92 of an inch at Fort Missoula.

Middle Plateau: .89 of an inch at Salt Lake; and .88 of an inch at Winnemucca.

Southern Plateau: .34 of an inch at Fort Grant to .57 of an inch at Prescott.

North Pacific Coast: 1.05 inches, at Portland.

Middle Pacific Coast: .67 of an inch at San Francisco to .81 of an inch at Red Bluff.

South Pacific Coast: .30 of an inch at Campo to .57 of an inch at Yuma.

AREAS OF HIGH BAROMETER.

Nine well-defined areas of high barometer appeared within the limits of the Signal Service stations during the month of March, 1882. They were first observed in the Rocky mountains, near the northern boundary of the United States, or on the north Pacific coast. Numbers i., ii., iii., vi., and ix. passed directly to the eastward and north of the Signal Service stations, while the general course of numbers iv., v., vii. and viii. was to the southeast and toward the south Atlantic coast.

I.—The 7 a. m. telegraphic report of the 2d indicated that this area of high barometer was central near Deadwood, and the 11 p. m. report of the same date showed that it was moving slowly eastward, the region of greatest pressure being near St. Vincent. From this point, the course of the centre was directly to the east as far as the St. Lawrence valley, where it disappeared rapidly in advance of low area number ii. Generally clear weather prevailed in the districts east of the Mississippi during the 3d, and the temperature fell below freezing in the lake region and below zero in Manitoba.

II.—The midnight report of the 4th showed the barometer to be above the normal at all stations west of the Mississippi river, and on the morning of the 5th the pressure had increased to .4 of an inch above the normal at stations in Washington Territory, Oregon and Dakota. This area passed from the north Pacific, over British Columbia, and was central near Fort Assinaboine on the afternoon of the 5th, the highest barometer then reported being 30.66.

On the morning of the 6th the temperature had fallen to —12° at Fort Garry, with a pressure of 30.61, but the centre of this area continued to the westward and near Fort Buford, where the barometer had risen to 30.73. During the 6th and 7th this area passed over the northern portion of the United States with increasing pressure near the centre, attended by cold northerly winds in the lake region and violent northeast gales on the New England coast. At the 7 a. m. report of the 8th, the barometer had risen to 30.80 at Parry Sound and the temperature was below freezing as far south as Virginia. Cold northerly winds and light snow were reported in Indian Territory and northern Texas, where the winds were slowly shifting to easterly in the southwest quadrant of this area. The barometer continued unusually high on the New England and Middle Atlantic coasts until the morning of the 9th, when the winds shifted to southeast and southwest, indicating that this area moved to the southeast after passing the coast line.

III.—This developed in the region north of Dakota, where it was central at the midnight report of that date. It moved rapidly to the southeast during the 10th and 11th, following the general course of the Missouri valley and passing over the southern states as an area of 30.40, attended by cold, fair weather. The barometer fell slowly at stations on the south Atlantic coast on the 12th, with southeast to southwest winds as this area disappeared to the eastward.

IV.—This probably developed in the Missouri valley during the 11th, but its centre could not be located on the tri-daily charts until midnight of the 12th, when the barometer was highest at Huron, Dakota. During the 13th, the area extended over the states of the Mississippi and Ohio valleys. On the 14th, it apparently divided; one portion passing from Tennessee northeastward over the lake region, while there was a slight increase of pressure on the South Atlantic coast. The barometer continued high in the districts on the South Atlantic coast until the 15th, when the area which passed northward over the lake region, disappeared to the eastward.

V.—The morning report of the 15th indicated the advance of this area from British America and the reports received during the 14th, from stations on the Pacific coast, indicate that it developed in the higher latitudes, east of the Rocky Mountains.

During the 15th and 16th, the barometer continued high in the northern districts of the United States. This area passed to the eastward with increasing pressure at the centre until it reached the St. Lawrence valley, when its course changed to the northeast. The following reports were received at midnight of the 17th: Father Point, barometer, 30.74; Anticosti, 30.76. The northeast winds at stations on the Atlantic coast and in the St. Lawrence valley, show that this area continued its easterly course after passing to the east of the maritime provinces.

VI.—This appeared in the Northwest, when the storm, traced as low area number vi, was central in Michigan on the 17th, but it passed to the east, north of the lake region, without causing any marked change of pressure within the limits of the United States. The lowest temperatures observed occurred on the morning of the 19th. St Vincent reporting —8° at the morning observation, and Moorhead reporting —8° as the minimum for that date. This area of high pressure did not reach the Atlantic coast, but disappeared rapidly in advance of low area number vii.

VII.—An extended area of cold, dry air appeared over the regions west of the 100th meridian on the 20th, the barometer reading, on that date from .3 to .4 of an inch above the normal at stations in Utah, Idaho, Oregon and Washington Territory. This area continued central in Utah or western Colorado, but a second area of high pressure was observed in Texas, where the rapid increase of pressure caused a severe norther on the Texas coast; the wind reached a velocity of fifty-three miles per hour at Indianola, and thirty-nine miles at Galveston between the 7 a. m. and 3 p. m. reports of the 21st. During the 22d the pressure increased over the southern states, where the barometer continued high until the 23rd, with fair weather and winds shifting to the south and west.

VIII.—Although first referred to as central in the Upper

Missouri valley on the 23d, this area probably extended over the North Pacific coast and British Columbia. The temperature fell from 20° to 30° in the northwest on the 23d, as the pressure increased rapidly in that region. The following minimum temperatures were reported at 7 a. m. of the 24th:

St. Vincent, —25°; Fort Garry, —24°; Moorhead, —20°; St. Paul, —5°.

During the 24th this area passed over the Ohio valley to the middle Atlantic coast, attended by cool, fair weather in all districts east of the Mississippi river.

IX.— This appeared in Manitoba at midnight of the 29th, advancing in a southeasterly direction. On the morning of the 30th the temperature had fallen from 20° to 30° at stations in Iowa, Michigan, Wisconsin and Minnesota. This area passed to the eastward over the lake region, causing the barometer to rise to 30.50 in New England and the Middle Atlantic states. The temperature fell about 20° in these districts and 30° in the St. Lawrence valley. After reaching the coast, the course appeared to change from east to southeast, and when last observed, at midnight of the 30th, the isobar of 30.50 extended from Boston to Norfolk, with northwest winds in New England, and southeast winds in the Middle Atlantic states.

AREAS OF LOW BAROMETER.

Ten areas of low barometer appeared within the limits of the Signal Service stations during the month, sufficiently well defined to render it possible to locate the centre of depression at each telegraphic report, from the date of first appearance until the disturbance finally passed beyond the station of observation. On chart number i will be found the tracks of the centres of areas of low barometer for the month of March, 1882. The following table gives the latitude and longitude in which each area was first and last observed, and the average hourly velocity:

Areas of low barometer.	First Observed.		Last Observed.		Average h'rly velocity in miles per hour.
	Lat. N.	Long. W.	Lat. N.	Long. W.	
	°	°	°	°	
No. I.	49	80	44	60	26.6
II.	41	114	43	64	27.6
III.	28	95	46	59	44.1
IV.	48	82	43	62	39.1
V.	46	103	37	75	33.3
VI.	47	122	50	66	37.8
VII.	55	127	45	75	34.8
VIII.	56	95	49	67	38.1
IX.	55	100	51	63	40.0
X.	57	112	48	63	26.7

The mean latitude of the above storm-tracks is about 10° north of the mean latitude of the storm-tracks of March, 1881. Numbers ii., vi., vii. and x. probably passed from the Pacific coast in a southeasterly direction to the points where first located. Number iii. developed in the gulf, south of Texas, and all the others were first observed in the Northwest.

I.—This storm passed from the southwest during the last of the previous month, causing violent winds in the lake regions and heavy rains in the southern states. On the morning of the 1st, it was central north of Lake Huron. From this point the movement was directly eastward, while the depression extended southward over the Middle Atlantic states and New England, with a rapid increase of gradient in the eastern quadrants, attended by dangerous east to south winds at stations on the Atlantic coast north of Wilmington, N. C. The storm increased in violence during the night of the 1st, the low area apparently dividing into two distinct depressions, one of which passed down the St. Lawrence valley, while the other passed from the Middle Atlantic coast northeastward over Nova Scotia during the 3d and 4th, where it disappeared as a severe storm.

Cautionary signals were ordered in advance of this storm at stations north of Cape Henry, and were fully justified by the violent winds which followed. Very heavy rain fell near the centre of disturbance as it passed to the St. Lawrence valley and Nova Scotia. This storm increased in energy as it advanced, and the barometer, at the centre, when last observed on the 4th, had fallen to 29.16 at Halifax, N. S.

The following abstracts from logs of vessels, probably show the progress of this storm during its passage eastward over the ocean: 4th, in 40° 32′ N., 67° 40′ W., s. s. "Egypt," w.n.w., moderate gale, squally; 40° 35′ N., 62° 10′ W., s. s. "Persian Monarch," fresh s,e. to w. gale, heavy head sea; 5th, in 40° 31′ N., 65° 35′ W., s. s. "Persian Monarch," fierce gale, tremendous sea.

II.—This depression was central in Colorado on the midnight of the 3d, but the telegraphic reports of the 2d, indicate that it developed west of the Rocky mountains. The barometer was high on the California coast on the 2d and 3d, and rain or snow prevailed in Washington Territory, Idaho, Oregon and Utah. The depression became unusually well-defined as it passed to the eastward over Kansas, the isobar of 29.70 forming a circle, the diameter of which was about 300 miles. By the midnight report of the 4th the centre of disturbance had reached St. Paul, Minnesota, where the barometer had fallen to 29.42, accompanied by southeasterly gales. Heavy snow was reported at Moorhead, Bismarck and Huron, Dakota, where the winds were from northeast to northwest, with velocities ranging from thirty-eight to forty-three miles an hour. The centre remained near St. Paul on the morning of the 5th; the gradient and winds having increased in the western quadrants of the storm. The advance of a high-area from the northwest on this date was attended by a decided fall in temperature in Dakota, Minnesota, Nebraska and Kansas. High winds continued in the upper lake region during the 5th, followed by clearing and cool weather after the winds had veered to westerly. The centre of this storm passed over Lake Superior, moving in a northeasterly direction. At midnight the course changed to the east, and during the 6th it crossed the St. Lawrence valley near Montreal and passed over New England, causing rain in the Middle Atlantic states, and snow in New England and the lake regions. The observer at Quebec reported: heavy snow and easterly gale.

Cautionary off-shore signals were displayed in advance of this storm at stations on the Atlantic coast north of Delaware Breakwater. The following maximum velocities were reported: Boston, 42, n.w.; Sandy Hook, 44, n.w.; Point Judith, R. I., gale; New Shoreham, 42, n.w. Cautionary signals were also displayed at Grand Haven, Milwaukee and Ludington, the stations on the lakes where signals are continued during the winter months.

When this depression reached the New England coast the barometer at the centre read 29.74, or .45 of an inch higher than the lowest reading, when the centre was near St. Paul. This storm left the New England coast near Eastport on the 7th, moving directly east. On the 9th, the s. s. "City of Brussels" reports, in lat. 43° 56′ N., long. 42° 42′ W., fresh w.n.w. gale and high sea.

No III.—This is the only storm occurring during the month, which developed south of the 30th parallel of latitude. A severe norther occurred in Texas on the 7th, the temperature falling below freezing in northern Texas, with light snow. The barometer continued high at all stations in the gulf states, with north to east winds, until the morning of the 8th, when the cyclonic movement of the winds indicated the advance of this depression. Heavy rains fell in the gulf states and in Tennessee on the 8th, as the storm centre moved up the Mississippi valley with increasing energy. The area of rainfall extended over the Ohio valley, and snow or rain was reported from the lake region and upper Mississippi valley. The course of the storm was northerly until the centre reached St. Louis, where its course changed to the northeast, the storm passing over the southern portion of the lake region with great violence, causing dangerous winds and heavy rains in the southern quadrants, and snow in the northern quadrants of the storm.

After reaching the upper St. Lawrence valley, the course of

the storm changed to easterly, and passed over New England on the 10th, with a pressure of 29.50 at the centre, followed by n.w. gales on the Atlantic coast.

Cautionary signals had been displayed in advance, at stations, between Macon and Sandy Hook on the 8th, and were ordered for stations on the New England coast on the 9th. The following maximum velocities were reported: Hatteras, 40 s.w.; Breakwater, 48 s.w.; Sandy Hook, 38 w.; Newport, 34 n.w.

This storm was last observed as central near Sydney, where the barometer had fallen to 29.34 at the afternoon report of the 10th; but the barometric gradient had decreased and the light winds reported from stations in the maritime provinces indicated that the storm had lost much of its energy.

On the 10th, the s. s. "Oder" in lat. 41° 59′ N., long. 62° 52′ W., reports moderate w.s.w. gale, rough sea.

IV.—This depression was first observed in the lake region on the morning of the 12th, and probably developed in British America, west of Manitoba. It passed over the St. Lawrence valley with increasing energy during the 12th, attended by light snow in the lake region, New England, and the northern part of the Middle Atlantic states. The barometer fell at the centre as the depression moved to the eastward, the lowest reading being 29.10, which was reported from Sydney on the 13th. Northerly gales occurred on the Atlantic coast at stations north of Savannah, after the centre had passed to the east of the coast line.

Cautionary signals were ordered at stations on the coast between Hatteras and New York, on the 12th, and "Off-Shore" signals were ordered for these stations at midnight of the 13th.

The following maximum wind velocities were reported during this display: Breakwater, 50 miles n.w.; Chincoteague, 46 n.w; Cape Henry, 44 n.w.; Sandy Hook, 40 n.

The following reports furnished through the co-operation of "The New York Herald Weather Service," probably indicate the presence of this storm during its passage eastward over the ocean.

On the 13th s. s. "New York" in lat. 34° 40′ N., long. 75° 15′ W., 29.65, w.s.w., gale, dark heavy clouds. 14th, in 37° 20′ N., 74° 50′ W., 30.15, n.n.w., hard gale, clear.

Ocean data from other sources as follows:

On the 16th, s. s. "Gallia" in lat. 44° 40′ N., long. 44° 25′ W., s.w. to n.w., fresh gale, high sea. 16th, s. s. "England" in lat. 42° 41′ N., long. 45° 11′ W., heavy gale, heavy head sea.

V.—On the 13th, the barometer fell to 29.57 at Olympia, and 29.63 at Portland, Oregon, with rain and snow on the North Pacific coast. This depression probably developed in the Upper Missouri valley on the 14th; while a second depression was central on the Pacific coast, north of Oregon. The 3 p. m. telegraphic report of the 14th, indicated the southeasterly course of this storm, which was then central north of Yankton, enclosed by the isobar of 29.70. Pressure increased at the centre during the 14th, and when the storm reached the lake region, the lowest isobar enclosing the centre was 29.90; which had taken the form of an elongated ellipse with the longer axis in a northwest direction. The pressure continued to increase at the centre during the 15th, when the storm passed eastward over the Ohio valley, and the barometric gradient decreased, with a corresponding loss of energy, until the disturbance passed east of the coast line near Norfolk. After the winds shifted to northerly on the Middle Atlantic coast they increased in force, with a rapid increase of pressure.

VI.—The barometer fell at stations on the Pacific coast during the 15th, with winds shifting to southerly at all stations south of Oregon. This depression was central north of Washing Territory on the morning of the 16th; at the morning report of that date, the winds had shifted to northerly at Portland and Olympia, with the barometer ranging from 29.62 to 29.66. The midnight report of the 16th indicated that this depression had passed eastward to the Upper Missouri valley, and the morning report of the 17th, showed a well defined depression of 29.60 central near Fort Sully; southeasterly winds, with threatening weather and rain prevailed in the Mississippi valley from the gulf coast northward to Lake Superior. This storm moved to the southeast until it crossed the Mississippi river, near Davenport, on the 18th, and then moved to the northeast over the lake region. The pressure increased at the centre after the disturbance reached the St. Lawrence valley, and the barometric gradient was slight in the eastern quadrants, although easterly gales occurred on the morning of the 19th, in the Gulf of St. Lawrence.

This storm lost much of its energy before passing beyond the maritime provinces, but it was followed on the 19th, by heavy snow and sleet in New England and Canada.

Cautionary signals were ordered in advance of this storm at all stations on the lakes, east of Marquette, and at all stations on the Atlantic coast, north of Fort Macon.

The following maximum velocities were reported: Mackinaw, 60 miles; Alpena, 36; Milwaukee and Rochester, 35; Point Judith, gale; Provincetown, 32; Eastport, 30.

The following reports furnished through the co-operation of "The New York Herald Weather Service," probably indicate the presence of this storm during its passage eastward over the ocean. On the 18th, s. s. "Celtic," in lat. 41° 02′ N., long. 69° 44′ W., s.e., strong gale, threatening and rain; barometer fell from 30.20 to 29.70, with sea running very high; 18th, s. s. "City of New York," in lat. 41° 00′ N., long, 61° 28′ W., n.n.w. to s.e., light winds to strong gale and very high sea. 19th, in lat. 40° 18′ N., long. 67° 41′ W., s.e. to w.n.w., strong gale to light airs; at 6 a. m. to 10.30 a. m., dense fog; 21st, s. s. "Britannic," in lat. 46° 34′ N., long, 38° 15′ W., w. to s.s.w., fresh wind to strong gale. 22d, in lat. 44° 09′ N., long. 44° 10′ W., strong w. gale and very high sea. 23d, in lat. 42° 53′ N., long, 50° 58′ W., s. to w.n.w., moderate to strong wind.

VII.—This storm, like the preceding one, developed west of the North Pacific coast where it appeared on the 19th. It moved rapidly during the 19th, from Washington Territory to western Nebraska. On the 20th, it was central near Omaha as a severe storm, and was moving slowly to the eastward with increasing barometric gradient and with a cyclonic movement of the winds within its limits. This storm also crossed the Mississippi river near Davenport, and during the 20th, the central area became extended in a southeast and northwest direction, the lowest barometer reading 29.49, at Chicago. At the morning report of the 21st, the barometer at Port Huron reached 29.49, and this storm continued with great violence over the entire lake region, where the barometer was low, but the pressure was increasing rapidly in the Upper Mississippi and Lower Ohio valleys. Heavy snow occurred in Michigan, Wisconsin and Minnesota on the 20th and 21st. The afternoon report of the 21st indicated the presence of two depressions in the lake region, one central near Rochester and one near Saugeen, both forming a part of this general disturbance which was then elliptical in form, the longer axis pointing east and west. The midnight report of the 21st, placed the centre of this disturbance north of and near Toronto, Canada, the two minor depressions having united. The central area retained its elliptical form. Snow continued in New England, Ohio valley and lake region during the 22d, followed during the night by clearing weather and high northwest winds on the coast. This storm passed east of the New England coast on the 22d.

Cautionary signals were ordered at 5 p. m. of the 20th at stations in the lake region and on the Atlantic coast, between Cape Henry and New York. At midnight of the same day signals were ordered at stations on the Atlantic coast north of New York.

The following maximum velocities indicate the force of this storm in the several districts: Milwaukee, 44 miles; Sandusky, 44 miles; Buffalo, 46 miles; Rochester, 53 miles; Cape May, 40 miles; Sandy Hook, 32 miles; Breakwater, 37 miles; New Shoreham, 36 miles.

The following report, furnished through the co-operation of "The New York Herald Weather Service," probably indicate the presence of this storm during its passage eastward over the ocean:

On the 23d, s. s. "City of Montreal," in 40° 59′ N., 55° 25′ W., wind s. to w.n.w., fresh gale and beam sea, to moderate wind and heavy sea.

Ocean data from other sources: 22d, s. s. "Holland," in lat. 41° 46′ N., long. 54° 51′ W., strong n.w. to s.w. gale, heavy s.s.w. sea, ship rolling heavily. Same date, s. s. "Vaderland," in lat. 40° 15′ N., long. 55° 22′ W., heavy w. gale, high sea; Same date, s. s. "Britannic," in lat. 44° 09′ N., long. 44° 10′ W., strong w. gale, very heavy sea. 23d, s. s. "Holland," in lat. 41° 30′ N., long. 57° 56′ W., s.s.w. gale, high confused sea. Same date, S. S. "Elbe," in lat. 40° 53′ N., long. 55° 58′ W., strong s.w. to n.w. gale, high head sea.

VIII.—This depression probably developed in British Columbia, but did not appear in the northwest until midnight of the 22d, when the barometer was lowest in Manitoba. It passed rapidly toward the upper St. Lawrence valley on the 23d with increased energy, the barometer having fallen to 29.72 by midnight of the 23d, when the disturbance was central near Kingston. High northwest winds occurred in the lake regions on the 23d, attended by fair weather and temperature below freezing. The morning report of the 24th showed a change in direction to the northeast. The centre of disturbance was advanced to FatherPoint, where the barometer had fallen to 29.53. South to west gales were reported from the St. Lawrence valley on the 24th, with heavy snows, and with temperature below zero at Rockliffe. The afternoon report of the 24th showed an increase of barometric gradients in the southern quadrants of this storm, the centre being located east of Father Point, where the pressure was 29.30. By midnight the area of lowest pressure had passed to the east of the maritime provinces, where the barometer was rising with westerly gales. At the same report the wind at the summit of Mount Washington attained a velocity of 82 miles, northeast; the afternoon report from Mount Washington on the same day, gave the wind as 112 miles, north.

Cautionary signals were ordered at stations on the upper lakes and Atlantic coast, at the afternoon report of that date.

The following maximum velocities were reported: Sandy Hook, 40 miles, n.w.; Breakwater, 36, n.w.; Buffalo, 38, s.w.; Milwaukee, 36, w.; Alpena, 36, n.w.; Shoreham, 36., n.w.

The following reports, furnished through the co-operation of "The New York Hearld Weather Service," probably indicate the presence of this storm during its passage eastward over the ocean. On the 26th, s. s. "Arizona" in lat. 41° 26′ N., long. 60° 34′ W., fresh gale, latter part, snow-squalls, winds s.s.w. to n.n.w. 27th, s. s. "Adriatic" in lat. 43° 32′ N., long. 41°.55′ W., moderate gale, squally, heavy head sea, wind s.w. to n.w. 28th, in lat. 41° 28′ N., long. 47° 30′ W., moderate gale during day, winds west.

IX.—This depression was first observed in British America, north of Dakota on the 24th, but its centre could not be located on the tri-daily charts until the midnight report of that date, when the barometer was lowest near Fort Garry. From this point the course of this storm was almost due south, until reaching central Iowa, where, after a slight movement to the east during the eight hours following the afternoon report of the 25th, its course changed to the southwest, and at the following report its centre was located in Kansas. During the 26th this storm moved over the lake region developing great energy, the barometer falling to 29.30, the lowest isobar being elliptical in form, the longer axis pointing to the northeast. This storm was followed by a secondary depression in the lower Mississippi valley on the 27th, which disappeared in advance of a high area from the northwest and a norther on the Texas coast. When this storm was central north of Lake Ontario dangerous westerly winds continued in the lake region and on the Atlantic coast, as far south as Jacksonville. The barometer fell to 29.13 at Father Point at midnight of the 27th, with wind s.w., fifty-five miles, and to 29.12 at Anticosti, with light southeast winds. At the last report the wind at Father Point was w., thirty-three miles.

Cautionary Signals were ordered for stations on Lakes Erie, Michigan and Huron at 4 p. m. of the 25th, and for stations on the Atlantic coast to New York on the morning of the 26th; and for stations between New York and Boston, at midnight of the 26th. Cautionary Signals for Eastport, Portland, Oswego and Rochester, were ordered on the morning of the 27th.

The reports show that this was one of the most severe storms of the season, especially over the maritime provinces. The following maximum velocities were reported at Signal Service Stations: Hatteras, 48, s.w.; Kittyhawk, 47, s.w.; Cape May, 44, s.; Breakwater, 48, s.; New Shoreham, 44, s.w.; Rochester, 36, n.w.; Sandusky, 36, s.w.; Provincetown, 37, s.w.

The following report, furnished through the co-operation of "The New York Herald Weather Service," probably indicate the presence of this storm, during its passage to the eastward over the ocean:

On the 27th, s. s. "Bothnia" in lat. 42° 03′ N., long. 57° 50′ W., strong breeze with squalls and high head sea; wind northwest.

X.—This depression was at no time within the limits of the stations of observation, but passed to the east, north of the United States, first appearing north of Dahota on the 28th. The course of the storm changed to the southeast after reaching the longitude of the lake region, and the disturbance became violent over Lakes Michigan and Superior, the wind reaching a velocity of forty-one miles at Milwaukee on the 29th. The gradient increased rapidly in the south and west quadrants of this storm as it moved to the northeast down the St. Lawrence valley and disappeared on the 31st, attended by violent gales at Father Point, Anticosti and other stations in the northeast.

INTERNATIONAL METEOROLOGY.

International charts iv. and v. accompany the present number of the REVIEW. The former is published for January, 1880, and continues the series of that chart begun in January, 1877. The "Beobachtungen auf dem Nordatlantischen Ocean," previously furnished this office through the courtesy of Prof. Dr. G. Newmayer, Director of the German Marine Observatory, has not been received for the month of January, 1880, and therefore was not used in the preparation of the present chart, as in the previous month. Chart v. is prepared for the month of April, 1880, and continues the series of that chart, begun in November, 1877.

Chart iv. shows the mean pressure, temperature and the prevailing direction of the wind at 7.35 a. m., Washington, or 0.43 p. m., Greenwich mean time, for the month of January, 1880, over the northern and at certain isolated stations in the southern hemisphere. The pressure is generally high, and is considerably above the average. There are two areas of comparatively low pressure, the most decided occupying Iceland and the southern part of Greenland, lowest mean reading, 29.58 at Stykkisholm; the least important, central over or near British Columbia, lowest mean reading, 29.90 at Olympia.

The position of the former low area is nearly a constant feature of that part of the Arctic regions where for the past three years the mean pressure has not risen above 30.00, except as follows: April, 1877, Godthaab, 30.02; May, 1877, Stykkisholm, 30.04; August, 1877, Godthaab, 30.06; November, 1878, Stykkisholm, 30.06; December, 1878, Stykkisholm, 30.10.

There are five decided areas of barometric maxima for the month, distributed as follows: In central Asia, 30.70; in central Mexico, 30.40; in eastern France and western Germany, 30.40; in the Middle Atlantic states, 30.20; in 35° N., 60° W., 30.20. The high pressure over central Europe appears to result from an extension northeastward of the barometric maxima prevailing in the vicinity of the Azores and Maderia Islands and thence to the south and west along parallel 30° N.

Compared with the corresponding chart for December 1879, the preceding month, there has been a general increase of pressure over Europe, Asia, and Northern Africa, within the limits of the stations of observation. The most marked increase is in eastern Siberia, where the small area of mean high barometer observed during the last month has extended, and now covers the northern portion of Asia, the pressure at the centre having increased from 30.49 to 30.74. The area of mean low barometer continues central over Greenland, the pressure at the centre having increased about .1 of an inch. Over the Atlantic, the barometer has fallen slighty between Newfoundland and the British Isles. The low area previously to the north of this latitude has extended southward along the 30th meridian west of Greenwich, while the gradient has increased decidedly from this meridian eastward towards the European coast. The high area of the North Atlantic has remained almost stationary, and is now central in lat. 35° N. long. 60° W., where the mean height of the barometer is 30.20. The area of high barometer which was central in Manitoba during the preceding month, has disappeared, and the low area from the North Pacific now extends over the western portion of British America.

The following extreme monthly mean temperatures are given in Fahrenheit's scale; *Lowest*: York Factory, —28°; Nertschinsk, —22°; Yeniseisk, —16°; Nikolaievsk on the Amoor, —11°; Barnaul, —6°; Fort Garry, —5°; Moose Factory, —2°. *Highest*: Fort Napier, 81°; Poona, 81°; Mauritius, 80°; Paramaribo, 79°; Peurto Berrio, 79°; Bridgetown, 78°; Navassa, 76°; Bombay, 76°; Fort de France, 75°; Kingston, 74°; Santiago de Cuba, 73°.

The prevailing direction of the wind over the United States was, northeasterly on the Atlantic coast; northerly on the Pacific coast south of Oregon; southerly in the Mississippi valley and the lake region; variable at the Rocky mountain stations; southerly in the plateau region and on the North Pacific coast. Over the Atlantic, the northeast trade-winds prevailed south of the 30th parallel; northwesterly winds over the North Atlantic west of the 40th meridian, and southwesterly, east of that meridian. In Europe: south to west in the British Isles; southeast to southwest in France and Spain; westerly in Russia. In India: variable and northerly on the coasts of China and Japan.

Compared with the corresponding month of January, 1879, the area of low barometer, central over Greenland, was more clearly marked. The pressure at the centre was then 29.36, or about .2 of an inch below that reported for the present month. The pressure over the North Atlantic was also from .2 to .3 of an inch below that of January, 1880. The pressure is about .2 of an inch lower on the North Pacific coast, where in January, 1879, the barometer ranged from 30.10 to 30.20. In central Asia, the barometer is .3 of an inch higher and the temperature is 10° lower.

The effect of the relative position of the high and low areas of pressure on the prevailing winds for the month, is shown by comparing this chart with the corresponding chart of January, 1879 when the area of mean low pressure was central in the North Atlantic, south of its present position, thus causing east to south winds at stations in western Europe; while, during January, 1880, the winds in northern Europe are westerly, tending toward the secondary low area, which has taken the place of the high area extending over that region during the previous year.

Compared with January of preceding years, the temperature over the United States was above the normal in all districts east of the Rocky mountains. It was from 10° to 15° above in the Upper Mississippi valley, Missouri valley, lake region, Ohio valley and southern states, and 8° to 9° in the New England and Middle Atlantic states. On the Pacific coast it was 7° below the normal for the month at Sacramento; 4° below at San Francisco; 1°.4 below at San Diego, and from 9° to 11° above at Umatilla and Boise City.

The following table exhibits the mean temperature and mean pressure for the month of January, 1880, in the several countries of Europe and Asia, compared with the means as determined from the years 1877, 1878, and 1879:

Countries.	Temperature.		Barometer.	
	Mean, January, 1877, 1878 and 1879.	Mean, January, 1880.	Mean, January, 1877, 1878 and 1879.	Mean, January, 1880.
Algiers	56.9	52.9	30.15	30.24
Austria	35.3	27.8	30.08	30.32
British Isles	41.2	40.6	29.94	30.25
Denmark	30.5	34.2	29.98	30.22
France	44.4	37.6	30.07	30.37
Germany	33.5	30.0	30.05	30.30
India	75.9	69.5	29.87	29.96
Italy	50.3	43.6	30.03	30.26
Norway	29.0	32.4	29.84	29.89
Portugal	52.9	49.7	30.21	30.27
Russia	21.2	19.8	30.18	30.08
Sweden	25.6	26.0	29.98	29.92
Spain	53.3	51.2	30.16	30.27
Turkey	49.9	41.6	30.04	30.22

The accompanying table shows the deviations in temperature and pressure at isolated stations for the month of January, 1880, as compared with the means for the past three years:

Comparative Thermometric and Barometric Means, with corresponding Departures.

STATION.	Mean Temperature.			Mean Barometer.		
	January, 1877-78-79.	January, 1880.	Departure.	January, 1877-78-79.	January, 1880.	Departure.
	°	°	°			
York Factory	—20.5	—27.6	— 7.1	30.04	29.98	—0.06
Godthaab	16.9	10.4	— 6.5	29.35	29.59	+0.24
Stykkisholm	29.5	32.9	+ 3.4	29.49	29.58	+0.09
Tromso	28.5	30.7	+ 2.2	29.70	29.55	—0.15
Thorshavn	37.6	41.4	+ 3.8	29.71	29.91	+0.20
Archangel	10.0	8.1	— 1.9	30.09	29.76	—0.34
Ekaterinburg	6.5	— 0.6	— 7.1	30.29	30.22	—0.07
Barnaul	— 2.9	— 6.0	— 3.1	30.50	30.63	+0.13
Yeniseisk	—11 4	—15.9	— 4.5	30.43	30.70	+0.27
Nikolaievsk on the Amoor	— 4.2	—10.5	— 6.3			
Zi-Ka-Wei	53.9	55.1	+ 1.2	30.42	30.42	Normal
Tokei	35.4	33.1	— 2.3	30.10	30.09	—0.01
Pekin	21.3	19.9	— 1.4	30.44	30.48	+0.04
Nukuss	25.4	21.0	— 4.4	30.30	30.23	—0.07
Beirut	61.9	54.7	— 7.2	30.07	30.11	+0.04
Mauritius	82.7	80.2	— 2.5	29.94	29.88	+0.04
Fort Napier	77.4	80.6	+ 3.2	29.81	29.79	—0.02
Paramaribo	79.4	79.4	Norm'l	30.00	29.93	—0.07
Funchal	64.8	64.6	— 0.2	30.25	30.18	—0.07
Ponta Delgado	61.3	60.3	— 1.0	30.23	30.02	—0.21
Bridgetown	80.5	78.3	— 2.2	30.01	29.91	—0.10
Navassa	78.5	75.8	— 2.7			
Melbourne	62.6	63.5	+ 0.9	30.00	29.94	—0.06
Hobart Town	67.2	62.7	— 4.5	29.85	29.82	—0.03
Astrakhan	24.4	18.9	— 5.5	30.30	30.16	—0.14
Athens	53.4	46.9	— 6.5	30.04	30.26	+0.22
Tiflis	40.5	31.5	— 9.0	30.21	30.18	—0.03
Laghouat	56.1	51.1	— 5.0	30.15	30.29	+0.14
Fort de France	76.8	74.5	— 2.3	29.93	29.93	Normal
Lisbon	55.1	50.4	— 4.7	30.17	30.28	+0.11
Sandwick Manse	38.2	41.8	+ 3.6	29.85	30.12	+0.27
Malta	59.1	56.6	— 2.5	30.02	30.13	+0.11

Chart V.—This chart displays the tracings of the probable courses of forty-three of the principal storm areas of the northern hemisphere for the month of April, 1880. The approximate paths of progressive movement are based upon about seven hundred daily simultaneous international observations. In addition, a mass of irregular data reaches this office in various ways, from the logs of vessels of the merchant marine of the North Atlantic and North Pacific oceans. Concerning the general distribution of the paths of the areas of barometric minima, the following is given:

Fifteen areas traversed portions of the United States, four of which entered from the Pacific ocean, two over California, and two over British Columbia, the rest entering from the British Possessions. Two areas entered the northwest coast of the British Possessions and two others pursued peculiar paths skirting the northwestern coast of North America. Four areas crossed the ocean to the mainland of Northern Europe. Several others very probably made the passage but could not be traced on the chart owing to lack of data. Fifteen areas

traversed parts of the North Atlantic ocean. Nine areas appeared over Europe, being chiefly confined to th northern and southern parts of the continent. Three areas passed northeastward over eastern Asia and four in the vicinity of the Japan Islands.

Of the storms first appearing in North America, the following brief descriptions are given:

I.—This depression appeared in the northern slope on the 1st and passed rapidly southeastward into the Lower Missouri valley where it was central during the 2d. During the 3d and 4th it occupied the lake region, and by the morning of the 5th became central in the Lower St Lawrence valley inclosed by the isobar of 29.40; 6th, central over the Gulf of St. Lawrence, passing thence northward to Greenland. During the 7th, 8th, and 9th the depression passed slowly eastward south of Godthaab, and on the 10th and 11th moved northeastward between Greenland and Iceland disappearing near the parallel of 70° N. The following observations indicate the influence of its passage northeastward in the vicinity of these islands; 7th, Godthaab, 29.27 a fall of 0.34 inch, s., force 4, snowing; Stykkisholm, 29.91, a rise of 0.26 inch, w., force 2, cloudy. 8th, Godthaab, 29.28, s., force 4, snowing; Stykkisholm, 29.88, s., force 7, cloudy. 9th, Godthaab, 28.85, n., force 2, cloudy; Stykkisholm, 29.77, s., force 8, cloudy. 10th, Godthaab, 29.65, calm, cloudy; Stykkisholm, 29.95, calm, raining. 11th, Godthaab, 29.78, calm, fair; Stykkisholm, 29.89, s. force 8, cloudy.

II —Central on the 1st in the Middle Pacific coast region. The depression passed northeastward on that day and the following into Montana. On the 3d, central in northern Dakota, it probably merged with area iii. at that time occupying the region north of Lake Superior.

III.—On the 1st the barometer at York Factory, B. A., fell 0.59 inch, wind n.w., snowing, central area inclosed by the isobar of 29.60. During the 2d and 3d, the depression moved southeastward north of the upper lake region, while southerly winds, with occasional rain prevailed from New England westward to Dakota.. On the 4th the depression combined with area I, then central in the Lower Lake region.

VIII.—This depression appeared off the Middle Pacific coast region in the vicinity of parallel 40° N., on the morning of the 2d, central area inclosed by the isobar of 29.40. San Francisco, 29.63, a fall of 0.28 inch, s.w., light rain; Sacramento, 29.56 a fall of 0.36 inch, s., heavy rain; Red Bluff, California, 29.39 a fall of 0.51 inch, s.e., light rain; Roseburg, Oregon, 29.30 a fall of 0.57 inch, n.w., light rain. 3d, depression central off the coast of Washington Territory, and moving northwestward. Olympia, 29.45, s.w., threatening; Esquimalt, Vancouver's Island, 29.44, n., cloudy. During the remainder of the storm's course, the position of the central area of barometric minima on the various days is located with some uncertainty, owing to insufficient reports. 4th, depression probably central off the northwestern coast of British Columbia; barometer at Sitka rose 0.05 inch, wind s.s.e., cloudy. 5th, depression moving to the westward off the Island of Baranoff, Sitka, 29.67, a fall of 0.10 inch, s.e., force 5, cloudy. 6th, Sitka, 29.67, e., force 3, cloudy. The further course of the depression could not be indicated upon the chart owing to the lack of reports.

IX.—Forming as a secondary depression to area ii., this area became central on the morning of the 3d in the Middle Slope, inclosed by the isobar of 29.40. Dodge City, 29.18, a fall of 0.05 inch, n., foggy; North Platte, 29.22, a fall of 0.09 inch, s.e., foggy. During the day the depression passed northeastward over the Lower Missouri valley combining on the following day with area i., then central in the lower lake region.

XIII.—This depression appeared to result from the westward movement of area viii. 8th, Sitka, 29.96 a rise of 0.15 inch, s.s.w., force 1, cloudy. 9th, Sitka, 29.69, a fall of 0.27 inch, w.n.w., force 1, cloudy. During the day the depression curved to the southeastward as it entered the British Possessions. 10th, Sitka, 29.49, a fall of 0.20 inch, calm, cloudy. After this day the course of the area could not be traced with accuracy owing to insufficient reports, but there seemed to be evidence that the depression formed a part of area xix.

XIX.—Central in Manitoba on the morning of the 12th the depression passed southward through Minnesota, and during the 13th combined with area xxi., then central in the Lower Missouri valley.

XIV.—This depression passed southeastward from the region of Hudson's bay during the 8th and 9th, and on the following morning occupied the western part of the lower lake region, inclosed by the isobar of 29.60. By the morning of the 12th it was central, with diminished energy, over the Gulf of St. Lawrence; 13th, probably central off the coast of Labrador. The influence of this depression as it passed northeastward over Greenland and Iceland, is shown by the following reports: 13th, Godthaab, 29.26, a fall of 0.64 inch, s., force 2, snowing; Stykkisholm, 30.11, w., force 4, clear. 14th, Godthaab, 28.93, a fall of 0.33 inch, s., force 7, fair; Stykkisholm, 30.00, a fall of 0.11 inch, s., force 4, cloudy. 15th, Godthaab, 29.36, a rise of 0.43 inch, s., force 7, snowing; Stykkisholm, 29.81, a fall of 0.19 inch, s.w., force 6, raining. 16th, Stykkisholm, 29.69, a fall of 0.12 inch, e., force 2, cloudy. During the day the depression disappeared to the north of Iceland in the vicinity of parallel 70° North.

XX.—This depression appeared on the 12th off the North Pacific coast region inclosed by the isobar of 29.80. Light rains with southwest to northwest winds prevailed in Oregon and Washington Territory. During this day, and the following, the depression moved with slight energy northeastward along the western coast of British America, and on the 14th disappeared to the westward in the vicinity of the meridian of 140° West.

XXI.—Central on the 13th in the Middle Plateau region the depression passed rapidly east and northeast to the upper lake region, and by the morning of the 15th became central in the vicinity of James' Bay. Moose Factory, 29.21, a fall of 1.06 inches, s.w., cloudy. During the 16th, 17th and 18th the depression passed slowly northeastward over Davis Straits and Greenland, combining on the 19th with area xxiii., then central southwest of Iceland.

XXII.—This depression appeared off the northwestern coast of British America on the 14th, and passed slowly eastward into the interior, being central on the 16th north of British Columbia inclosed by the isobar of 29.40. On the 18th the depression became central in the Saskatchewan valley, and by the morning of the 20th occupied eastern Montana; 21st, central in the Middle Slope inclosed by the isobar of 29.60. During the day the depression passed rapidly eastward over the upper Lake region, disappearing on the 22d in the Lower St. Lawrence valley.

XXVI.—This depression appeared central in northern Texas on the 15th, inclosed by the isobar of 29.60. During this day and the following, the depression passed rapidly eastward to the lower lake region, and thence southeastward on the 17th off the New England coast; 18th, central south of Nova Scotia. In 38° 46′ N., 64° 22′ W., 29.77, n.w., force 6, 5 hours rain, hazy weather; in 41° N., 63° W., n.w., strong gale. 19th, in 39° 38′ N., 58° 49′ W., 29.80, n., force 7, 2 hours rain, hazy weather; in 42° 44′ N., 50° 56′ W., 29.64, s., force 2, dense fog. During the 20th and 21st the depression passed rapidly northeastward west of the British Isles, and on the morning of the 22d was central east of Iceland. Stykkisholm, 29.34, s.w., force 2, raining; Thorshavn, 29.40, n.w., force 5, fair. 23d, central off the northwestern coast of Norway. From the 24th to the 27th the depression passed slowly eastward over northern Russia, and on the 28th, became central in the valley of the Obi. 30th, the depression disappeared eastward beyond the Yenesi.

XXVIII.—Appearing on the 17th in the middle slope, the depression moved northeastward to the upper lake region, where it became central on the 19th Marquette, 28.93, a fall of 0.87 inch, s., cloudy; Duluth, 28.89, a fall of 0.79 inch, n.w., cloudy; Escanaba, 29.00, a fall of 0.86 inch, s.w., cloudy; St. Paul, 29.07, a fall of 0.40 inch, n.w., sleeting; 20th, central

northeast of James's Bay, with diminished energy, and by the following morning the barometer at Godthaab, Greenland, had fallen 0.38 inch, wind shifting from n.e., force 4, clear weather, to s., force 7, snowing. During the 22d the depression disappeared to the eastward north of Iceland.

XXIX.—This depression entered the northwestern coast of British America on the 18th and 19th, and by the morning of the 20th was central in British Columbia inclosed by the isobar of 29.60. During the day it combined with xxxi., then central in the northern plateau.

XXXI.—This depression entered the North Pacific coast region on the 20th, and by morning of the 22d, occupied central Montana. Virginia City, 29.38, calm, light snow. 23d, central in the Lower Missouri valley, inclosed by the isobar of 29.00. Light to heavy snow, with southwest to northwest winds in Colorado and Montana, and light to heavy rain, with southeast to northeast winds in the Upper Mississippi and Lower Missouri valleys and the Northwest. From the 24th to the 26th it passed slowly northeastward to the upper lake region, and, by the following morning, became central over the Gulf of St. Lawrence. 28th, the depression central off the southern point of Greenland. Godthaab, 29.42, a fall of 0.33 inch, wind shifted from south to northeast. On the 30th, this depression combined with area xli., while central off the eastern coast of Greenland.

XXXII.—This depression appeared central on the 20th in the Eastern Gulf States, and, during the day, moved rapidly eastward off the coast; 21st, probably central northeast of the Bermudas, moving thence rapidly northward to parallel 50° North. Changing its course slightly to the west of north, the depression, on the 25th, became central off the southeastern coast of Greenland. Godthaab, 29.26, a fall of 0.50 inch, n.e., force 4, cloudy. During this day and the two succeeding, the depression skirted the eastern coast of Greenland and disappeared on the 27th in the vicinity of parallel 70° North.

XXXIX.—Central in the Saskatchewan valley on the 27th, this depression moved southeastward into the Lower Missouri valley, and thence northeastward to the upper lake region, in which latter district it was central on the 29th, inclosed by the isobar of 29.60. During the day it moved eastward to the Lower St. Lawrence valley, where it was central on the morning of the 30th. The continuation of this area will appear on chart v. for May, 1880.

XL.—This depression passed northeastward from its position on the morning of the 28th, in about 47° N., 148° W., to the northwestern coast of British America, which it entered during the 30th. The continuation of this area will probably appear on chart v. for May, 1880.

Of the storms first appearing over the Atlantic ocean, the following brief descriptions are given.

IV.—This depression is a continuation of area xxv. of chart v. for March, 1880. It was central on the 1st, southeast of Newfoundland and passed northeastward between the parallels of 45° and 55° N. On the 4th, combined with area vi., then central off the northwestern coast of the British Isles; 4th, in 54° 30′ N., 17° W., 29.10, w., force 6, squally; in 52° N., 29° W., strong n.w. gale; in 54° N., 18° W., hard w.s.w. to w. gales, with very high sea.

VI.—This depression is a continuation of area xxii. of chart v. for March 1880, central on the 1st east of Greenland, it moved slowly southeastward to the northern portion of the British Isles, where it was central on the 6th. During this period of movement the following reports show the influence of the depression. 1st, Stykkisholm, 28.81, s.e., force 9, raining; Thorshavn, 29.41, s.e., force 5, fair; North Unst, 29.53, s.s.e., force 8, cloudy. 2d, Stykkisholm, 28.74, e., force 7, raining; Thorshavn, 29.11, s.e., force 7, raining; North Unst, 29.38, s.s.e., force 8, cloudy. 3d, Stykkisholm, 28.82, e., force 7, cloudy; Thorshavn, 29.03, s.w., force 5, fair; North Unst, 29.22, s.s.e., force 8, cloudy. 4th, Stykkisholm, 29.06, n.e., force 4, snowing; Thorshavn, 28.98, se., force 7, fair; North Unst, 29.10, s., force 6, cloudy. 5th, Stykkisholm, 29.30, n.e., force 7, clear; Thorshavn, 28.96 e., force 3, cloudy; North Unst, 29.04, s., force 6, cloudy; Monach Light-house, 28.81, w.s.w., force 7, cloudy. On the 6th throughout the British Isles the barometer fell below 29.35, with southwest to northwest winds, and with rainy or threatening weather. During the 7th, the depression moved rapidly southeastward into central Europe; 10th, central in northeastern Turkey, and on the 11th disappeared east of the Black sea.

XII.—This was central on the 7th south of Nova Scotia. It was accompanied by northeasterly winds and clearing weather in the Canadian maritime provinces, except in Newfoundland, and by southerly winds, with rain, near parallel 40° N.; 8th, in 47° 45′ N., 40° 40′ W., 29.74, s.s.e., force 6, cloudy; in 42° 26′ N., 46° 43′ W., 29.79, w., force 4, moderate sea. During the 9th, the depression passed northward from near 55° N., 45° W., and on the 10th it combined with area i., then central between Greenland and Iceland.

XVIII.—This depression appeared and was central on the 11th, in about 45° N., 25° W., and, during this day and the following, it passed southeastward into northern Spain, where it became central on the 13th. Bilbao, 29.65, a fall of 0.14 inch, s., cloudy; Madrid, 29.74, a fall of 0.20 inch, s., 28 miles per hour, cloudy; Santiago, 29.48, a fall of 0.09 inch, s.e., raining. It was central in Portugal on the 14th, and moved eastward over southern Spain, disappearing on the 15th on the western coast of the Mediterranean.

XXIII.—Central off the Banks of Newfoundland on the 14th, the depression moved eastward along the parallel of 50° N., until the 16th, when it changed its course to the northeast, becoming central od the 19th, south of Iceland. On the 20th, the depression moved from a position southwest of Iceland, northeastward over that island, and, on the 22d, combined with area xxvi. It was then central north of the Faroe Islands. The following ship reports give evidence of the influence of the depression:

14th, in 42° N., 55° W., n.w. and w.s.w., heavy storm, snow, and hail squalls, very high sea; in 47° N., 32° W. s.w. to n.w., very stormy, rain and heavy sea; in 51° N., 30° W., s.e. to s.w. and n.w., strong gales, very high sea, much water on deck, heavy rain, snow and hail at intervals; in 46° 44′ N., 47° 20′ W., w. and n.w. strong gales, very heavy sea. 15th, in 45° N., 46° W., s.w. to n.w. strong gale, very high sea; in 47° N., 36° W., s. to n.w., strong to heavy gale, thunder and lightning and heavy sea; in 49° N., 34° W., n.w. and w.n.w., tempest, very high sea and breakers, hail and rain; in 47° 10′ N., 31° 25′ W., 29.55, w.s.w., force 6, very high sea, raining; in 49° 33′ N., 24° 40′ W., 29.76, s., force 5, cloudy and threatening; in 46° 33′ N., 37° 23′ W., 29.55, n.w., force, 8, rain and hail showers. 16th, in 48° 05′ N., 25° 50′ W., 29.27, w.n.w., force 6, very high sea, hailing; in 45° 35′ N., 25° 15′ W., 29.48, w., force 7, very high sea, rain and hail; in 45° 44′ N., 40° 14′ W., 29,64, w. to n.w., force 8, rain and hail showers; in 45° N., 41° W., n.w., heavy gale, frequent violent squalls, very high sea; in 45° N., 39° W., w.n.w., wild breaking sea, tremendous squalls; in 45° N., 41° W., n.n.w., strong gale, high sea, heavy squalls; in 48° N., 36° W., w. to n.n.w., tempest and hurricane, very high sea, much water on deck, slowed engines for 14 hours and then hove to. 17th, in 48° N., 30° W., w.n.w. to w.s.w., strong, very high sea; in 44° N., 44° W., n.w., heavy gale, frequent violent squalls, tremendous sea; in 44° N., 43° W., w.n.w., tremendous squalls, wild breaking sea; in 46° N., 40° W., w. to n.w. and n., tempest, very high sea, much water on deck, rain and hail, slowed engines and hove to for six hours; in 48° 45′ N., 20° 05′ W., 29.05, s.s.w., force 2, raining; in 46° 50′ N., 21° 30′ W., 29.10, s.w., force 7, drizzling rain; in 44° 50′ N., 42° 14′ W., 29.46, w. to n.w., force 7 to 8, rain and hail showers, very high sea. 18th, in 49° 05′ N., 14° 30′ W., 29.28, s.w., force 6, very high sea, showery; in 48° 35′ N., 17° 35′ W., 29.21, s.w., force 7, very high sea, cloudy; in 51° N., 20° W., s.w. to n.w, strong gale, very high sea.

XXIV.—Central on the 14th in about 50° N., 30° W., this depression moved northeastward off the western coast of the

British Isles, during the 15th and 16th, accompanied by violent s.w. to n.w. gales, with rain and hail squalls. 17th, depression central north of the Shetland Isles, followed by southerly winds, with cloudy or rainy weather throughout nearly the whole of the British Isles. During this day and the following the depression filled up over Scandinavia.

XXXVII.—Central on the 25th in about 35° N., 55° W., this depression moved rapidly northeastward to the parallel of 50° N., disappearing on the 27th in an area of high pressure, 30.30, then prevailing off the western coast of the British Isles.

XLI.—This depression appeared central southeast of Newfoundland on the 28th. In 42° 14′ N., 54° 04′ W., 29.79, s.w. to n.w., force 3, foggy; in 42° 52′ N., 48° 51′ W., variable winds, five hours rain, foggy. During the 28th and 29th the depression moved northward to parallel 60° N., and on the 30th united with area xxxi., then central west of Iceland.

Of the storms first appearing in Europe, the following brief descriptions are given.

V.—Central on the 1st over the North sea, the depression moved slowly eastward over Denmark and southern Sweden, disappearing on the 4th south of the Gulf of Finland.

X.—Central in northern Italy on the 5th, the depression passed northeastward into southern Austria, where on the 6th the central area was inclosed by the isobar of 29.60. Passing north of Black sea on the 7th, the depression disappeared during the 8th, north of the Caspian sea.

XI.—This barometric disturbance appeared as a slight depression in central Spain on the 6th. During this day, and the following, it moved northeastward over the Mediterranean, being central south of Sardinia on the 11th, southeast of Sicily on the 12th, and disappearing over Asiatic Turkey on the 13th.

XVII.—This depression appeared over northern Lapland on the 10th, and by the following morning was central east of the the White Sea. On the 12th and 13th, a large area of 29.40 prevailed in the vicinity of the Ural Mountains between the parallels of 50° and 60° N. 13th, Ekaterinburg, 29.27, a fall of 0.18 inch, wind shifting from w.s.w. to n., snowing; Tashkend, 29.56, a fall of 0.24 inch, calm, cloudy; Kasan, 29.56, a rise of 0.03 inch, n., cloudy. During the 14th and 15th the depression passed eastward over southwestern Asia, and on the 16th disappeared beyond the Yenisei.

XXV.—This depression entered the extreme portion of northern Norway on the 14th, and passed slowly southeastward north of the White Sea, being central on the 17th in northwestern Siberia. On the 19th the depression disappeared eastward beyond the Yenisei.

XXXIII.—Central on the 20th southeast of the White Sea, the depression continued the same direction of movement until the following day, when it changed to the northeast, and on the 22nd became central in the valley of the Obi. On the 23d the depression disappeared eastward beyond the Yenisei.

XXXVIII.—This depression first appeared in southern France on tle 26th, and moved thence northeastward over northern Italy and southern Austria, being central, on the 29th, north of the Black Sea. On the 30th disappeared over southeastern Russia.

XLII.—Central on the 28th over Finland, the depression passed slowly eastward along the parallel of 60° N., and, on the 30th, became central in northwestern Siberia. The continuation of this area will probably appear on chart v., for May, 1880.

Of the storms appearing on the Asiatic coast the following brief descriptions are given:

VII.—This depression is probably a continuation of area xxvii., of chart v., for March, 1880.

XV.—Appeared central south of the Island of Formosa on the 8th, and moved thence northeastward, being, on the 10th, central north of the Island of Kinsin. During the day the depression moved southeastward over Japan and disappeared on the 11th in about 30° N., 140° E.

XXX.—This depression passed northeastward from the province of Amoor on the 19th, disappearing over the Okhotsk Sea on the 20th.

XXXIV.—Central south of the Amoor in the province of Manchooria on the 21st, the depression moved northeastward over the province of Amoor and, on the 23d, disappeared over the Okhotsk Sea. 22nd, Nikolaievsk, 29.70, a rise of 0.01 inch, wind changed from calm to n.e., cloudy. Nertchinsk, 30.14, a rise of 0.20 inch, wind shifted from e.s.e., to w.s.w., calm, clear.

XXXV.—This depression appeared on the 21st over the Yellow sea, inclosed by the isobar of 29.70. At Japanese stations the winds shifted from se. to ne., with rapidly falling barometer; Nagasaki, 29.80, a fall of 0.38 inch, e.n.e., raining, 2.21 inches rainfall in past 24 hours; 22d, central over the southern portion of the Japan sea; Hiroshima, 29.64 a fall of 0.42 inch, s., cloudy, 18.19 mm. rainfall in past 24 hours; Nagasaki, 29.74, a fall of 0.06 inch, w.s.w., cloudy; Tokei, 29.95, a fall of 0.32 inch, s.s.w., raining, 21.72 mm. rainfall in past 24 hours; Wakayama, 29.64, a fall of 0.53 inch, e., raining, 6.50 mm. rainfall in past 24 hours; 24th, Tokei, 29.47, a fall of 0.48 inch, s.w., clear; Wakayama, 29.61, a fall of 0.03 inch, s., fair; Hiroshima, 29.65, a rise of 0.01 inch, w., clear; Nagasaki, 29.77, a rise of 0.03 inch, w.s.w., cloudy. During the 24th the depression disappeared east of the Island of Yesso.

XXXVI.—This depression appeared central in the western portion of the Province of Macchooria on the 25th; Nertchinsk, 29.61, a fall of 0.41 inch, calm, cloudy; 26th, central in the Province of Amoor: Nertchinsk, 29.81, a rise of 0.20 inch, n.w., clear; Nikolaievsk on the Amoor, 29.76, calm, clear. 27th, Nikolaievsk, 29.58, a fall of 0.18 inch, e., cloudy; Nertchinsk, 29.88, n.w., clear; 28th, Nikolaievsk, 29.52, a fall of 0.06 inch, w., cloudy. On the following day the depression disappeared to the eastward over the Okhotsk sea.

XLIII.—This appeared as a slight but extensive depression over northeastern China and the Japan sea on the 29th and 30th, a continuation of which will probably appear on chart v. for May, 1880.

OCEAN ICE.

February 12, 1882, in 46° 50′ N., 47° 00′ W., bark "Johannes" passed two large icebergs and large quantities of field ice. February 18th, in 46° N., 49° W., bark "Nova Scotia" passed through large quantities of drift ice; 22d, in 44° 60′ N., 45° 30′ W., bark "Argonaut" passed large iceberg 70 feet high. February 23d, the s. s. "Helvetia" reported having met with immense fields of ice floating northward to the banks; in 47° N., 47° W., she was completely surrounded by ice; 24th, s. s. "Bavarian," in 45° N., 48° W., passed an iceberg and large quantities of drift ice; same date, in 45° 30′ N., 49° 00′ W., s. s. "St. Germain" was in an immense ice-field; 23d, in 45° 20′ N., 46° 00′ W., s. s. "New York City" passed large quantities of pack ice and several icebergs from sixty to three hundred feet high; 26th, in 46° 00′ N., 47° 54′ W., s. s. "City of Lincoln" passed ice; same date, in 43° 10′ N., 49° 00′ W., s. s. "City of Paris" passed field ice and one small iceberg; in 44° 00′ N., 49° 00′ W., s. s. "Palestine" passed large quantities of field ice and small icebergs; 27th, in 46° 20′ N., 47° 00′ W., s. s. "Rialto" ran into a field of ice and several large icebergs; ice being so heavy, stove in both bows, and was obliged to steer s.e. for two hundred miles to clear the ice; 28th, in 43° 59′ N., 48° 32′ W., s. s. "Main" passed a large icefield; same day, in 46° 26′ N., 41° 25′ W., s. s. "Persian Monarch" passed large quantities of ice; March 1st, in 44° 46′ N., 49° 29′ W., s. s. "Elbe" passed several icebergs and large icefields; March 1st, in 43° 35′ N., 49° 10′ W., s. s. "Germania" passed large fields of ice. The s. s. "Istrian" reported: March 1st and 2d, passed through large quantities of ice, extending in length from forty to fifty miles. The s. s. "Rotterdam" between 46° 30′ N., 46° 00′ W., and 44° 00′ N., 52° 00′ W., passed 27 icebergs, and had to cross an icefield. In 44° 58′ N., 46° 41′ W., s. s. "Persian Monarch" passed a quan-

tity of field ice. March 2d, in 43° 45′ N., 48° 40′ W., s. s. "Lake Champlain" passed large quantities of field ice and several icebergs; 7th and 8th, s. s. "Oder" between 45° 09′ N., 48° 50′ W., and 44° 52′ N., 50° 03′ W., passed numerous icebergs and floating ice. Steamer "Otranto" reported: March 6th, (no position given) at 2 p. m., passed an iceberg of great size and from that time up to 10.30 p. m., passed 16 others and field ice extending as far as the eye could reach; 10th, in 47° 00′ N., 46° 30′ W., s. s. "Thornholme," passed a large iceberg, also ice-field five or six miles long, also, on 11th, at 6 a. m., passed two very large icebergs, one of which was estimated to be four miles in length, and was very high; 18th, in 44° 04′ N., 47° 53′ W., s. s. "Salier," passed several large icebergs; 21st, Bark "Fremad," two days sail from New York, passed through large field of ice. The s. s. "Newfoundland" at St. Johns, N. F., March 28th, reports two vessels jammed in the ice, thirty miles sw., of Cape Pine, also heavy ice everywhere on the coast; 14th, in 43° 29′ N., 49° 05′ W., s. s. "Batavia," passed an iceberg; 10th, in 42° 30′ N., 50° 00′ W., s. s. "City of Brussels" passed a small iceberg; 13th, in 44° 39′ N., 47° 36′ W., s. s. "Devonia," passed several small icebergs; 12th, in 44° 09′ N., 49° 12′ W., s. s. "Donau," passed two icebergs; 14th, in 42° 31′ N., 50° 05′ W., s. s. "Erin," passed an immense iceberg; 17th, in 43° 35′ N., 49° 10′ W., s. s. "Glamorgan," passed two large icebergs, from three hundred to five hundred feet long and one hundred feet high; 11th, in 45° 58′ N., 48° 40′ W., s. s. "Iberian" passed through large quantities of field ice, and saw several large icebergs: 15th, in 43° 47′ N., 49° 60′ W., s. s. "Lake Manitoba" passed three icebergs. March 3d, bark "Plymouth" in 43° 40′ N., 50° 25′ W., passed through about 20 miles of field ice and saw several icebergs: 19th, in 46° 30′ N., 47° 30′ W., s. s. "Limosa" passed through heavy field ice. The whaling steamer "Esquimaux" arrived at St. Johns, from Dundee, February 28th, and reports having been 13 days among vast fields of ice that stretched n. e. and s. over two hundred miles from the Newfoundland co st. The pack caught her tightly and she remained in it until she drifted up to St. Johns' Harbor. At last accounts, five steam whalers are visible from Cape Spear, locked in the ice and drifting helplessly southward. Between Cape Race and Cape Bonavista there are now driving southward, no less than a hundred and fifty icebergs, and their rate is about 2¼ miles per hour.

TEMPERATURE OF THE AIR.

The distribution of mean atmospheric temperature over the United States and Canada for the month of March, 1882, is exhibited on chart ii, by the dotted lines in black. The table of mean comparative temperatures, in the lower left-hand corner of the chart, shows, in the first column, the average temperature for the month from the various districts, as determined from observations taken at Signal Service stations during the month of March of previous years; the second column shows the mean temperature for the current month; the third column shows the departure of the mean temperature of the current month from the mean of several years. The temperature is above the normal in all districts east of the Rocky mountain range; and below the normal in the districts on the Pacific coast, except in Oregon and Washington Territory, where it has averaged about 8° above the mean. It has ranged from 4° to 5° above the normal in the southern states, Ohio and Missouri valleys; about 3° above in the middle states and lake region; about 5° below in the middle plateau region; and about 1° below in California.

DEVIATIONS FROM MEAN TEMPERATURE.

Under this heading departures exhibited by reports from the regular Signal Service stations are shown in the table of comparative temperatures on the left-hand side of chart ii. The following items of importance, in connection with this subject, are reported by voluntary observers:

Connecticut: Southington, mean temperature varies less than 1° from the average of past 12 years and has not been marked by extremes.

Illinois: Riley, mean temperature 33°.8 or 3°.8 above the average of past 21 years; higher mean temperatures occurred in 1868, '71, '78 and '79.

Indiana: Vevay, mean temperature 50°.27 or 7°.47 above the average for past 17 years. Mean temperature of winter, beginning with December, 1881, and ending February 28th, 1882, is 41°.23 or 7°.9 above the average winter mean for past 17 years.

Iowa: Clinton, mean temperature slightly above the average.

Kansas: Lawrence, mean temperature 46°.90 or about 5°.42 above the average of past 14 years; mean temperature for the month at 7 a. m., 40°: at 2 p. m, 55°.93; at 9 p. m. 45°.85. Yates Centre, mean temperature 46°.5 or 8°.4 above the average of past 2 years. Wellington, mean temperature 47°.4 or 3°.3 above the average of the past 3 years and 2°.2 below the mean of March, 1879.

Maine: Gardiner, mean temperature 28°.91 or 0°.91 below the average of past 56 years. Mean temperature of winter (from December, 1881, to March, 1882, both inclusive) is 24°.35 or 1°.24 above the average of the past 46 years. The lowest temperature of the past winter—27° occurred January 25; the lowest on record at this place—40°, occurred in January, 1857; the highest minimum temperature for any winter during that period—12°, occurred in January, 1845. During the past winter the temperature fell below zero on 21 dates; during the winter of 1855–6. on 59 dates, and during the winter of 1841–2, on only 10 dates.

Maryland: Fallston, mean temperature 41°.52 or 2°.67 above the average of past 11 years; during that period the highest mean 46°.20 occurred in 1871, and the lowest 32°.90 occurred in 1872.

Michigan: Thornville, mean temperature 35°.9 or about 5° above the average of the past 15 years.

Missouri: St. Louis, Missouri Weather Service reports mean temperature 47°.6 or about 4° above the average of the past 45 years. During that period the mean of March, 1882, has been exceeded 13 times; the highest mean 56°.5 occurred in 1842; the lowest 27°.5 in 1843; Protem, mean temperature 55.45, the highest since 1860.

New Hampshire: Contoocookville, mean temperature 31°.5 is about the average for March for the past 12 years.

New York: Waterburg, mean temperature, 33.1 which is the highest that has occurred during the past 11 years with the exception of March, 1878, mean 37°.4; North Volney, mean temperature 51°.59 or 2°.76 above the average of past 14 years. During that period the highest monthly mean 37°.39 occurred in 1878; lowest 21°.15 occurred in 1872.

Ohio: North Lewisburg, mean temperature 42.0 or 3°.3 above the average of 51 years.

Pennsylvania: Wellsboro, mean temperature much higher than for any previous year since 1856.

Virginia: Wytheville, mean temperature 45°.6 or 3° above the average of past 18 years.

West Virginia: Helvetia, mean temperature 44.68 or 4°.67 above the average of the past 6 years.

RANGES OF TEMPERATURE AT SIGNAL SERVICE STATIONS.

Monthly ranges of temperature during the month of March varied from 19° to 89° at stations east of the Rocky mountains, and from 32° to 75° at stations on the Pacific coast. The smallest ranges are: Key West, 19°; Port Eads, 23°; Punta Rassa, 27°; New Orleans, 28°; San Francisco, 32°; Mobile and Hatteras 33°; Delaware Breakwater, 34°; Brownsville, Tex., 37; San Diego, 39°. The largest: Ft. Buford, Dak., and Ft. Shaw, Mont., 89°; Ft. Benton, Mont, 88°; Bismarck, Dak., 87°; Ft. Bennett, Dak., 84°; Huron, Dak., 81°; Ft. Assinnaboine, Mont., and Yankton, 80°; Ft. Missoula, Mon., and Ft. Washakie, Wyo., 78°; Ft. Keogh, Mont., 76°; Ft. Custer, Mont., and Eagle Rock, Idaho, 75°. The daily ranges varied in the different districts as follows: New Eng-

Table of Comparative Minimum Temperatures for the Month of March.

State or Territory.	Minimum for March, 1882, Signal Service.		Lowest since Signal Service stations were opened—3 to 11 years.			Lowest from any other source.			
	Station	Temp.	Station.	Temp.	Year.	Place.	Temp.	Year.	Length of Record.
		°		°			°		
Alabama	Montgomery	42	Montgomery	25	1873	Huntsville	11		9 years.
Arizona	Prescott	13	Prescott	— 8	1876	Fort Canby	— 1		12 "
Arkansas	Little Rock	39	Little Rock	32	'80 & '81	Fort Smith	— 3		22 "
California	Campo	15	Campo	19	1880	Fort Bidwell	0		11 "
Do						Fort Crook	2		12 "
Colorado	Pike's Peak	—24.5	Pike's Peak	—29	1875	Fort Garland	—10	1875	29 "
Do	West Las Animas	6	Colorado Springs	— 4	1875	Fort Lyon	—10	1880	22 "
Do						Pagosa Springs	—20	1881	1 "
Connecticut	New Haven	13	New Haven	6	'75 & '76	Colebrook	—10		10 "
Do						New Haven	— 9		76 "
Dakota	Fort Stevenson	—21	Pembina	—31	1880	Fort Abercrombie	—40		19 "
Do			Fort Stevenson	—28	1879	Fort Buford	—40	'67 & '71	16 "
Delaware	Delaware Breakwater	28	Delaware Breakwater	25	1880	Fort Delaware	5		45 "
Do						Milford	5	1877	4 "
Dist. of Columbia	Washington	23	Washington	4	1873	Washington	— 5		49 "
Florida	Cedar Keys, Jacksonville and Pensacola	47	Jacksonville	31	'73 & '76	Fort Barrancas	28		61 "
Do			Lake Village	26	1873	Fort King	27		10 "
Georgia	Atlanta	34	Augusta	22	1873	Atlanta	12		4 "
Do						McPherson Barracks	12		6 "
Idaho	Eagle Rock	—16	Boise City	10	1879	Fort Hall	— 1		5 "
Illinois	Champaign	21	Chicago	1	1873	Fort Armstrong	—14		9 "
Do						Rock Island Arsenal	—14		11 "
Do						Belvedere	—20	1877	5 "
Indiana	Indianapolis	24	Indianapolis	2	1873	St. Iceland	0		15 "
Do						Kokoma	—10	1875	1 "
Indian Territory	Fort Supply	17	Fort Gibson	10	1878	Fort Gibson	7		55 "
Do						Camp Supply	— 2	1876	2 "
Iowa	Des Moines and Davenport	10	Dubuque	—10	1875	Algona	—25		10 "
Do			Keokuk	—10	1873	Vale	—20	1880	7 "
Kansas	Dodge City	14	Dodge City	— 8	1880	Fort Riley	—20		21 "
Do						Fort Leavenworth	— 9		52 "
Kentucky	Louisville	31	Louisville	3	1873	Newport Barracks	3		29 "
Do			Lexington	— 1	1873				
Louisiana	Shreveport	41	Shreveport	26	1876	Fort Jesup	16		23 "
Do						Baton Rouge	26		58 "
Maine	Eastport	10	Eastport	— 1	'75 & '80	Gardiner	— 0		42 "
Do						Brunswick	—19		53 "
Maryland	Baltimore	26	Baltimore	5	1873	Fort McHenry	0		52 "
Massachusetts	Boston and Springfield	15	Springfield	— 1	1875	Williamstown	—1		62 "
Do						Billerica	—14	1875	11 "
Michigan	Alpena	0	Escanaba	—20	1875	Fort Brady	—32	1875	60 "
Do						Ontonagon	—2		11 "
Minnesota	St. Vincent	—25	Breckenridge	—32	1873	Fort Ripley	—37		18 "
Do						Minneapolis	—27		12 "
Mississippi	Vicksburg	43	Vicksburg	27	1876	Columbus	20		10 "
Missouri	Springfield	24	St. Louis	8	'73 & '76	Harrisonville	—12		6 "
Do						St. Louis	— 6		39 "
Montana	Fort Shaw	—18	Fort Benton	—42	1876	Fort Ellis	—36		13 "
Do						Fort Benton	—42	1876	12 "
Nebraska	Omaha	5	North Platte	—21	1880	Glendale	— 0	1868	2 "
Do						Bellevue	—15		11 "
Nevada	Winnemucca	— 3	Winnemucca	2	1880	Fort Halleck	— 8	1880	13 "
Do						Camp McGarry	— 6		3 "
New Hampshire	Mount Washington	—19.5	Mount Washington	—51	1874	Dartmouth College	—23		18 "
Do						Stratford	—22		11 "
New Jersey	Sandy Hook and Barnegat	20	Cape May	9	1873	Patterson	0		9 "
Do			Squan Beach	9	1875	Newark	2		22 "
New Mexico	Santa Fe	9	Santa Fe	0	1880	Fort Union	—12	1882	31 "
New York	Oswego	15	Albany	— 4	1875	Madison Barracks	—30		56 "
Do			Malone	— 4	1876	Sackett's Harbor	—34		8 "
North Carolina	Charlotte	30	Kittyhawk	20	1876	Franklin	6	1876	5 "
Do			Willmington	20	1873	Fort Johnson	14		58 "
Ohio	Columbus, Cleveland & Sandusky	22	Cleveland	— 2	1873	Granville	—14		16 "
Do						College Hill	—10		64 "
Oregon	Umatilla	26	Umatilla	12	1880	Camp Harney	— 3		6 "
Do						Fort Klamath	— 6	1880	6 "
Pennsylvania	Erie	21	Erie	2	1877	Pennsville	—14		6 "
Do			Pittsburgh	2	'74 & '77	Carlisle Barracks	— 6		37 "
Rhode Island	Newport	18	Newport	9	1876	Fort Adams	— 6		40 "
South Carolina	Charleston	40	Charleston	26	1873	Fort Moultrie	25		38 "
Do						Edgefield	20	1876	2 "
Do						Charleston	31		105 "
Tennessee	Knoxville	29	Knoxville	6	1873	Glenwood Cottage	11		11 "
Do						Humboldt	— 5	1876	2 "
Texas	Fort Elliott	18	Fort Elliott	— 2	1880	Fort Davis	9		23 "
Do						Fort Griffin	9	1876	7 "
Utah	Salt Lake City	11	Salt Lake City	4	1874	Fort Crittenden	— 2		3 "
Do						Coalville	—20	1880	6 "
Vermont	Burlington	4	Burlington	— 4	1873	Randolph	—27		5 "
Do						Lunenburgh	—23		17 "
Virginia	Fort Myer	22	Wytheville	— 1	1873	Fortress Monroe	13		57 "
Do						Snowville	9		6 "
Washington T'y	Spokane Falls	7	Spokane Falls	7	1882	Fort Colville	—20		20 "
West Virginia	Morgantown	22	Morgantown	0.5	1873	Weston	2	1876	3 "
Do						Helvetia	4	1877	5 "
Wisconsin	La Crosse	10	La Crosse	—23	1873	Superior City	—24		3 "
Do						Fort Crawford	—23		76 "
Wyoming	Fort Washakie	— 3	Cheyenne	—17	1880	Fort Bridger	—39		20 "
Do						Fort Sanders	—28	1875	4 "

land, Mt. Washington, 36° on 28th; Burlington, 29°, 28th; Boston, 28°, 20th; New London, 27°, 24th. Middle Atlantic states, New York, 24°, 19th; Cape May, 28°, 29th; Albany, 22°, 18th; Washington, 30°, 26th; Norfolk, 31°, 26th. South Atlantic states, Augusta, 35°, 3d; Kittyhawk, 32°, 30th; Charleston, 32°, 3d; Savannah, 28°, 24th. Florida peninsula, Key West, 13°, 10th; Punta Rassa, 23°, 2d; Cedar Keys, 24°, 23d. Eastern Gulf states, 20°, 31st; Vicksburg, 25°, 29th; Montgomery, 28°, 2d. Western Gulf states, Mason, Tex., 39°, 30th; San Antonio, Tex., 37°, 10th; Ft. Gibson, 34°, 1st; Denison, Tex., 33°, 28th; Indianola, 23°, 9th; Galveston, 16°, 9th, 29th. Ohio valley and Tennessee, Knoxville, 35°, 2d; Louisville, 30°, 27th; Nashville, 31°, 29th; Columbus, 29°, 15th, 26th; Memphis, 29°, 25th; Indianapolis,

28°, 9th, 23d. Lower lake region, Rochester and Cleveland, 33°, 29th; Sandusky, 30°, 29th; Oswego, 28°, 29th. Upper lake region, Escanaba, 33°, 23d; Alpena and Port Huron, 32°, 23d; Duluth, 30° on 24th; Grand Haven, 20°, 27th. Upper Mississippi valley, Des Moines, 41°, 25th; Keokuk, 34°, 25th; La Crosse and St. Paul, 31°, 31st. Missouri valley, Yankton, 49°, 22d; Ft. Bennett, 50°, 31st; Omaha, 38°, 22d, 25th; Leavenworth, 35°, 14th. Extreme northwest, Ft. Buford, 49°, 7th; Bismarck, 50°, 27th; Moorhead, 42°, 24th. Northern slope, Cheyenne, 39°, 19th; North Platte, 42°, 24th; Ft. Keogh, 44°, 21st, 30th. Middle slope, Pike's Peak, 25°, 21st; Ft. Elliott, 42°, 2d; Dodge City, 46°, 22d; Denver, 39°, 24th. Southern slope, Concho and Ft. McKavett, 41°, 30th; Stockton, 46°, 5th; Ft. Griffin, 44°, 28th; Henrietta, 34°, 28th. Northern plateau, Umatilla, 38°, 31st; Eagle Rock, 39°, 22d; Ft. Missoula, 43°, 31st. Middle plateau, Winnemucca, 36°, 31st; Pioche, 32°, 31st; Salt Lake City, 30°, 31st. Southern plateau, Prescott, 50°, 22d; Phœnix, 47°, 21st; Tucson, 44°, 31st; La Mesilla, 50°, 2nd; Santa Fe, 32°, 21st; Silver City, 44°, 10th. North Pacific coast region, Olympia, 25°, 12th; Portland, 31°, 30th; Roseburg, 37°, 30th. Middle Pacific coast region, San Francisco, 21°, 27th; Sacramento, 26°, 31st; Red Bluff, 33°, 22nd. South Pacific coast region, San Diego, 30°, 23d; Campo, 50°, 23d; Yuma, 39°, 29th.

FROSTS.

In the various districts they were reported on the following dates: New England, 3d, 5th, 7th to 27th, 29th, 31st; Middle Atlantic states, 3d to 9th, 11th, 13th to 20th, 22d to 26th, 28th, 29th, 31st; South Atlantic states, 11th, 14th to 17th, 23d, 25th, 26th, 29th; East Gulf states, 11th, 14th, 22d, 23d, 29th; West Gulf states, 1st, 6th to 11th, 13th, 21st to 24th, 27th 28th; Rio Grande valley, 9th, 10th; Ohio valley and Tennessee, 1st, 2d, 4th to 8th, 10th, 11th, 13th to 17th, 21st to 26th, 28th to 31st; lower lake region, 2d to 26th, 28th to 31st; upper lake region, 1st to 31st; extreme northwest, 1st to 31st, upper Mississippi valley, 1st, 2d, 3d, 5th to 15th, 19th to 25th, 27th to 31st; Missouri valley, 1st to 16th, 19th, 21st to 24th, 26th, 28th to 31st; northern slope, 1st to 13th, 15th to 26th, 29th; middle slope, 1st to 30th; southern slope, 7th to 10th; southern plateau, 1st to 31st; middle plateau, 1st to 24th, 26th, 27th, 31st; northern plateau, 1st to 7th, 9th to 12th, 16th to 21st; north pacific coast region, 1st, 2d to 13th, 18th to 21st, 23d; middle pacific coast region, 3d, 4th, 9th, 19th to 23d; south pacific coast region, 1st, 4th to 8th, 10th, 15th, 17th, 18th, 20th to 23d. Frosts injurious to vegetation were reported as follows: Charlotte, N. C., 23d, peas entirely killed; peach buds and wheat injured. 25th, further injury to wheat and fruit by frost. Charleston, S. C., on 23d, light frost damaging strawberries and early vegetation. Sacramento on 20th, frost killing tender vegetation. Coleman City, Tex., 8th, all kinds of young plants and the buds of fruit trees were frost bitten. Henrietta, Tex., 9th, peach crop much injured by severe weather of past two days.

ICE.

Regarding its formation in the northern sections, this subject is considered elsewhere in THE REVIEW, under the head of "Ice in Rivers and Harbors." The following are exceptional cases of its formation in the southern sections of the country:

Augusta, Ga., 23d; Mason, Texas, 7th and 8th; Indianola, 9th, 10th; Fort Apache, Arizona, 8th; ice formed during night, an unusual occurrence for this season at this place; Red Bluff, 20th, formed during night on quiet water; Ashwood, Tenn., 11th, 14th, 23d, 25th; Austin, Tenn., 23d, 25th; Murfreesboro, Tenn., 14th, 23d, 25th; Coleman City, Texas, 7th.

LOW TEMPERATURES.

Ft. Stevenson, Dak., 20th, worst blizzard of whole winter; 21st, blizzard still raging; Eagle Rock, Idaho, 6th, coldest weather ever experienced here at this season; 7th, stock men complain of severe losses on account of severe cold weather.

Table of Maximum and Minimum Temperatures for March, 1882.

State or Territory.	Signal Service. Station.	Max.	Min.	U. S. Army Post Surgeons or Voluntary Observers. Station.	Max.	Min.
		°	°		°	°
Alabama	Montgomery	86	42	Auburn		33
Arizona	Yuma	95		Maricopa	101	
Do	Prescott		13			
Arkansas	Little Rock	83	30	Mount Ida	84	29
California	Los Angeles	88		Antioch	95	
Do	Campo		15	Summit		— 4
Colorado	West Las Animas	77	6	Pagosa Springs	80	— 8
Do	Pike's Peak	33	—24.5			
Connecticut	New Haven	59	13	Southington		11
Do	New London	59				
Dakota	Yankton	80		Fort Randall	85	
Do	Ft. Stevenson		—23	Pembina		—24
Delaware	Breakwater	62	28			
District of Columbia	Washington	71	23			
Florida	Jacksonville	88		Fort Barrancas		41
Do	Cedar Keys, Jacksonville and Pensacola		47			
Do						
Do						
Georgia	Augusta	89				
Do	Atlanta		34			
Idaho	Ft. Lapwai	80				
Do	Eagle Rock		—16			
Illinois	Cairo and Springfield	73		Anna	78	
Do				Geneseo and Morrison		8
Do	Champaign		21			
Indiana	Indianapolis	71	24	Lacona	78	
Do				Spiceland		21
Indian Territory	Fort Supply	85	17			
Iowa	Des Moines	74	10	Logan	78	4
Do	Davenport		10			
Kansas	Dodge City	81	14	Manhattan and Wellington		12
Do				Bowling Green	79	30
Kentucky	Louisville	75	31			
Louisiana	Shreveport	90	41			
Maine	Portland	54		Orono		—2.7
Do	Eastport		10			
Maryland	Baltimore	60	26	Cumberland	72	
Do				Deer Park		13
Massachusetts	Boston	61	15	Somerset	63	
Do	Springfield		15	South Lee		3
Michigan	Port Huron	64		Fort Brady		—12
Do	Alpena		0			
Minnesota	St. Paul	58		New Ulm	61	
Do	St. Vincent		—25			
Mississippi	Vicksburg	84	43	Fayette	86	41
Missouri	Saint Louis	79		Protem	86	
Do	Springfield		24	Corning		9
Montana	Forts Custer and Keogh	76		Ft. Shaw		—19
Do						
Do	Fort Shaw		—18			
Nebraska	Omaha	77	5	Lincoln	89	
Do				Genoa		2
Nevada	Winnemucca	74	3	Humboldt	82	
Do				Elko		— 7
New Hampshire	Mt. Washington	37	—19.5	Auburn	58	10
New Jersey	Atlantic City	66		Freehold		16
Do	Sandy Hook and Barnegat		20			
Do						
New Mexico	La Mesilla	87		Ft. Union		—12
Do	Santa Fe		9			
New York	New York City	67		Johnstown		2
Do	Oswego		15			
North Carolina	Wilmington	82		Murphy		27
Do	Charlotte		30			
Ohio	Cincinnati	70				
Do	Cleveland, Columbus and Sandusky			Jacksonburg	72	
Do				Ruggles and New Athens		18
Do			22			
Oregon	Umatilla	77	26			
Pennsylvania	Pittsburg	75		Dyberry		8
Do	Erie		21			
Rhode Island	Newport	57	18			
South Carolina	Charleston	85	40	Stateburg	89	36
Tennessee	Knoxville	83	29			
Do	Chattanooga	83				
Texas	Rio Grande	96				
Do	Fort Elliott		18			
Utah	Salt Lake City	68	11	Coalville		0
Vermont	Burlington	54	4	Lunenburg		— 7
Virginia	Cape Henry	76		Snowville	80	20
Do	Fort Myer		22	Wytheville		20
Washington Ter.	Dayton	77				
Do	Spokane Falls		7			
West Virginia	Morgantown	72	22	Helvetia	76	20
Wisconsin	Madison and Milwaukee	62		Beloit	67	
Do				Ashland		— 2
Do	La Crosse		10			
Wyoming	Fort Washakie	74	— 3	Ft. Bridger		—16

PRECIPITATION.

The distribution of rainfall over the United States and Canada for March, 1882, as determined from observations taken at over five hundred stations, is exhibited on chart iii. The table at the left hand corner of this chart shows the average monthly rainfall, determined from the records of the Signal Service stations in the several districts, and the excess or deficiency of rainfall as compared with the average for many years. Exam-

ination of the table shows that there has been a deficiency of rainfall along the Gulf coast, New England, the middle states, the Missouri valley, North Pacific coast region, and at the Rocky mountain stations. The greatest deficiency occurred on the North Pacific coast, where the monthly rainfall is more than 4.00 inches below the average. A slight excess of rainfall occurred in the lake region, Tennessee, the Ohio valley, Upper Mississippi valley, the extreme northwest, and the South Atlantic states. A slight excess of rainfall is also reported from California. At the station on Mount Washington an excess of 8.03 inches is reported, while the rainfall in the districts of New England averages about 1.00 inch below the mean for the month. It will be seen from the chart that the area of greatest rainfall extends over the Lower Mississippi, the Tennessee, Cumberland, and Lower Ohio valleys, where the rainfall for the month has ranged from 6.00 to 10.00 inches.

DEVIATIONS FROM AVERAGE PRECIPITATION.

Under this heading departures exhibited by the reports from the regular Signal Service stations are shown in the table of comparative monthly rainfalls, as published in the lower left-hand corner of chart iii. The following items of importance in connection with this subject are reported by voluntary observers:

Illinois: Riley, monthly precipitation 4.58 inches, has been exceeded but twice during past nineteen years, viz: in 1877 and 1881.

Indiana: Vevay, monthly precipitation 6.30 or 2.27 inches above the average of past seventeen years.

Iowa: Clinton, monthly precipitation slightly above the average.

Kansas: Lawrence, monthly precipitation 1.62 inches or 0.62 inch below the average of past fourteen years. The total precipitation for January, February, and March, 1882, is 3.98 inches or 0.79 inch below the average of the same months for the same period. Yates Centre, monthly precipitation 2.04 inches or 0.62 above the average of the past two years. Snow fell to a depth of 3¾ inches during the month which is above the average of past two years. Wellington, monthly rainfall 0.96 or 0.43 inch below the average of past three years.

Maine: Gardiner, monthly precipitation 5.04 or 1.11 inches above the average of past forty-six years. Snowfall for the past winter, 91¾ inches or slightly above the mean; the smallest winter snowfall, 30¼ inches occurred in 1837–8; the largest, 146 inches occurred in 1842–3. Days of sleighing during the past winter numbered 65; average for 46 years, 85½; the least number 16 days occurred during the winters of 1839–40 and 1841–2; the largest number 136 days occurred during the winter of 1872–3.

Maryland: Fallston, monthly precipitation 3.28 or 1.30 inches below the average of past eleven years. During that period the largest monthly precipitation 6.40 and 7.53 inches occurred in 1871 and 1881, respectively; the smallest 1.70 inches occurred in 1874.

Massachusetts: Worcester, monthly precipitation 3.32 inches, which is 2.78 inches below that of 1881 and 0.20 inch below the average. The amount of snowfall during the month, 5½ inches is 10¾ inches below that of March 1881, and is nearly 5 inches below the average.

Missouri: St. Louis, Missouri Weather Service reports, monthly precipitation 3.39 inches or 0.35 inch below average of past forty-five years. *New Hampshire:* Contoocookville, monthly snowfall 4 inches or about 11 inches below the average of past 12 years.

New York: North Volney, monthly precipitation 3.12 inches or 0.15 inch below the average of past nine years. During that period the largest monthly precipitation 6.97 inches occurred in 1873; smallest 2.00 inches occurred in 1879.

Virginia: Wytheville, monthly precipitation 3.16 inches or 0.14 inch below the average of past eighteen years.

West Virginia: Helvetia, monthly precipitation 6.65 or 1.85 inches above the average of the past six years.

SPECIAL HEAVY RAINS, INCLUDING MELTED SNOW.

1st, Paterson, N. J., 3.63 inches; Lenoir, N. C., 2.80; Ardenia, N. Y., 4.70; Fayetteville, Ark., 3.00; Hatteras, N. C., 3.71; Cedar Keys, Fla., 2.38 in 1 hour and 40 minutes; Kittyhawk, N. C., 3.75; Mt. Washington, 4.96. 2d, Eastport, Me., 3.18. 5th, Memphis, 3.78. 7th and 8th, Bowling Green, Ky., 2.50 in 16 hours. 8th, Vicksburg, 2.66. 12th, Forsyth, Ga., 2.38 in 12 hours. 19th, College Hill, Ohio, 4.00. 20th, Cincinnati, 2.54. 26th, Ames, Ia., 2.79; Mt. Vernon Barracks, Ala., 4.81, from 7:15 a. m., to 9:30 p. m.; Ft. Barrancas, Fla., 2.27 in 1 hour and 30 minutes; Auburn, Ala., 1.58 in 1 hour and 30 minutes. 26th and 27th, Quitman. Ga., 6.83, in 32 hours; Columbia, S. C., 3.59 in 26 hours; Montgomery, Ala., 3.80. 27th, Wilmington, N. C., 4.75, of which 3.31 fell in 8 hours; Augusta, Ga., 4.17, of which 2.70 fell in 8 hours. 27th and 28th, Smithville, N. C., 5.18 of which 2.12 fell in 8 hours; Fayetteville, N. C., 8.25, of which 6.00 fell from 11 a. m. to 10 p. m. 28th, Ft. Macon, N. C., 5.71.

LARGEST MONTHLY RAINFALLS, INCLUDING MELTED SNOW.

Cisco, Cal., 25.30 inches; Summit, Cal., 19.30; Alta, Cal., 15.40; Mt. Washington, 14.52; Fayetteville, N. C., 13.38; Truckee, Nev., 12.00; Forsyth, Ga., 10.46; Boca, Nev., 10.20; Bowling Green, Ky., 9.99; Hatteras, N. C., 9.67; Macon, N. C., and Nashville, 9.36; Auburn, Ala., 9.28; Memphis, 9.10; Austin, Tenn., 8.90; St. Meinrad, Ind., 8.51; Mt. Vernon Barracks, Ala., 8.41; Ashwood, Tenn., 8.15; Smithville, N. C., 7.81; Eastport, 7.54; College Hill, Ohio, 7.50; Vicksburg, 7.41; Auburn, N. H., 7.25; Morgantown, W. Va., 7.18; Green Springs, Ala., 7.15; Wilmington, N. C., 7.09; Halifax, N. S., 7.06; Ardenia, N. Y., 7.05; Chatham, N. B., 7.00; Colfax, Cal., 6.97; Montgomery, Ala., 6.82; Augusta, Ga., 6.80; Murfreesboro', Tenn., 6.77; New River, N. C., 6.67; Helvetia, W. Va., 6.65; Tennant, Cal., 6.57; Kitty Hawk, N. C., 6.49; Murphy, N. C., 6.40; Portsmouth, N. C., 6.35; Sydney, N. S., and Vevay, Ind., 6.30; Little Rock, 6.25; Cincinnati, 6.17; Auburn, Cal., 6.05.

SMALLEST MONTHLY RAINFALL, INCLUDING MELTED SNOW.

Benson, Casa Grande, Prescott, Texas Hill, Wilcox and Yuma, Ariz., Indio, Mammoth Tank and Mojave, Cal., and Ft. Wallace, Kan., none; Laredo, Tex., and Phœnix, Ariz., trace; Key West, Fla., and Ft. Verde, Ariz., 0.01; Ft. Davis, Tex., 0.03; Kelton, Utah, 0.05; Yankton, Dak., and Cheyenne, Wyo., 0.06; Rapid City, Dak., and Terry's Landing, Mont., 0.07; West Las Animas, Col., 0.10; Desoto, Neb., 0.13; Ft. Washakie, Wyo., and Punta Rassa, Fla., 0.15; Ft. Garland, Col., 0.16; Foley, Mont., and Ft. Collins, Col., 0.17; Denver, Col., and White Water, Cal., 0.20; Santa Fe, 0.23; Dodge City, 0.24; Ft. Stanton, N. M., 0.26; Brook Haven, N. Y., 0.28; Pioche, Nev., Corinne and Terrace, Utah, 0.30; Helena, Mont., 0.31; Umatilla, Or., 0.32; Ft. Meade, Dak., 0.33; Olivet, Dak., 0.34; Ft. Bridger, Wyo., 0.35; Lordsburg, N. M., and El Passo, Tex., 0.38; Ft. McKavett, Tex., 0.39; Tecoma, Nev., Ft. Wingate, N. M., and Lunenburg, Vt., 0.40; Ft. Keogh, Mont., and La Mesilla, N. M., 0.41; Ft. Sully, Dak., 0.42; Ft. McDermit, Nev., 0.44; Lincoln, Neb., and St. Augustine, Fla., 0.45.; Deer Lodge, Mont., 0.47; Clay Centre, Kan., and Ft. Lewis, Col., 0.50.

RAINY DAYS.

The number varied in New England from 12 to 23; Middle Atlantic states, 12 to 19; South Atlantic states, 4 to 17; Florida peninsula, 2 to 6; east Gulf states, 7 to 14; West Gulf states, 11 to 15; Rio Grande valley, 6 to 11; Ohio valley and Tennessee, 13 to 20; lower lake region, 17 to 24; upper lake region, 18 to 25; extreme northwest, 13 to 19; Upper Mississippi valley, 9 to 18; Missouri valley, 5 to 15; northern slope, 2 to 18; middle slope, 2 to 10; southern slope, 4 to 10; southern plateau, 0 to 7; middle plateau, 6 to 11; northern plateau, 9 to 14; North Pacific coast region, 17 to 23; Middle Pacific coast region, 10 to 13; South Pacific coast region, 0 to 10.

CLOUDY DAYS.

The number varied in New England from 7 to 11; Middle Atlantic states, 5 to 14; South Atlantic states, 4 to 12; Florida peninsula, 1 to 3; East Gulf states, 5 to 8; West Gulf states, 5 to 15; Rio Grande valley, 9 to 16; Ohio valley and Tennessee, 6 to 15; lower lake region, 14 to 18; upper lake region, 11 to 18; extreme northwest, 8 to 13; Upper Mississippi valley, 8 to 17; Missouri valley, 6 to 11; northern slope, 1 to 12; middle slope, 2 to 5; southern slope, 2 to 8; southern plateau, 1 to 8; middle plateau, 2 to 8; Northern plateau, 7 to 13; North Pacific coast region, 14 to 15; Middle Pacific coast region, 6 to 19; South Pacific coast region, 1 to 11.

SNOW.

The dates on which snow fell in the various districts are as follows: New England, 1st to 7th, 9th to 14th, 16th to 27th, 29th, 30th, 31st; Middle Atlantic states, 3d, 7th, 9th to 19th, 21st to 26th; Ohio valley, 10th to 17th, 21st to 24th, 27th; lower lake region, 3d, 6th, 7th, 8th to 17th, 21st, 22d, 24th, 25th, 26th, 28th, 30th, 31st; upper lake region, 2d, 4th to 18th, 20th to 31st; extreme northwest, 1st to 6th, 9th, 13th to 21st, 23d to 29th; Upper Mississippi valley, 4th to 12th, 14th, 15th, 20th, 21st, 22d, 25th; Missouri valley, 4th to 12th, 14th, 15th, 16th, 19th, 20th, 21st, 23d, 24th, 26th, 28th, 29th; northern slope, 1st to 12th, 14th to 20th, 22d to 26th, 28th, 29th, 30th; middle slope, 3d to 10th, 18th, 20th, 26th, 27th; southern slope, 5th to 9th; southern plateau, 6th, 7th, 8th, 17th, 25th; middle plateau, 1st to 10th, 13th to 20th, 22d, 24th, 25th, 26th; northern plateau, 2d to 5th, 7th, 8th, 9th, 11th, 13th, 15th to 20th, 25th; North Pacific coast region, 2d, 3d, 4th, 8th, 14th, 17th, 18th, 19th.

Snow was also reported from the following stations not included in the districts named above: Cape Lookout, N. C., 8th; Weldon, N. C., 15th; Fort Gaston, Cal., 19th; San Gorgonio, Cal., 17th; Red Bluff, Cal., 10th.

Particularly heavy, or remarkable snow falls were reported as follows: Genesco, Ill., 9th, furious snow storm, the snow attaining the depth of eight inches; Muscatine, Ia., 9th, one of the severest snow storms ever experienced; Burlington, Ia., 9th, heaviest snow storm of season; depth ten inches on level; all telegraph wires between this city and Chicago were grounded; no communication East, except *via* St. Paul; Ft. Sully, Dakota, 5th, 6th, very heavy snow storm; travel over wagon roads suspended; trains delayed: Huron, Dakota, 20th, very severe snow storm, accompanied by wind, attaining a velocity of sixty-six miles. Snow fell in blinding sheets, making it impossible to see objects twenty feet distant; at 9 a. m., the wind shifted to nw., and increased from eight to forty-four miles in less than fifteen minutes, and afterwards, increased steadily until 3 p. m., when the maximum velocity was reached; 21st, the storm continued with unabated fury until after sunset, occasioning great inconvenience and suffering to immigrants camping on the prairies. A number of cattle perished from exhaustion and cold. Pike's Peak, Colorado, 26th, the most terrific snow storm of the season began at 11.15 a. m., and continued all day. The instrument shelter, store-room and stable were filled with snow to a depth of two feet. The snow penetrated the openings in the roof and ceiling, completely covering the desk, bed and office floor; 27th, snow drifted about station to depths of from ten to twelve feet.

LARGEST MONTHLY SNOW FALL.

Cisco, Cal., 251 inches; Summit, Cal., 193; Truckee, Nev., 120.5; Boca, Nev., 102; Alta, Cal., 86; Mt. Washington, about 66; Carson City, Nev., 50.4; Colfax, Cal., 44; Eagle Rock, Idaho, 34.5; Duluth, Minn., 27.2; Pike's Peak, Col., and Wells, Nev., 26.5; Alpena, Mich., Milwaukee, Wis., and Reno, Nev., 25; Moorhead, Minn., 24.6; Grand Haven, Mich., about 24.5; St. Paul, Minn., 23.8; Battle Mountain, Nev., 21; Port Huron, 20.9; Winnemucca, Nev., 20; Eastport, Me., and Escanaba, Mich., 18; Northport, Mich, 17.3; Beowawe, Nev., 16.5; Palasade, Nev., 16; Blackfeet Agency, Mont., 15.2; Orono, Me., and Newport, Vt., 15; Embarrass, Wis., 14.8; Otega, Nev., 14.1; Lunenburg, Vt., and Golconda, Nev., 13.5; Ft. Assinnaboine, Mont., 13.2; Franklin, Wis., and St. Vincent, Minn., 13; Rockford, Ill., 12.8; Erie, Pa., 12.2; Ashland, Wis., Dexter, Me., and Elko, Nev., 12; New Shoreham, R. I., 11.9; Rowe, Mass., 11.5; Riley, Ill., 11.3; Wadsworth, Nev., 11; Muscatine, Ia., Niles, Mich., and Burlington, Vt., 10.5; Ft. Benton, Mont., Carlin, Nev., and Rochester, 10; Lansing, Mich., Minneapolis, Minn., and Browns, Nev., 9.5; Clinton, Ia., 9.3; Keokuk, 9.2; Lawrence and Holton, Kan., Stafford, Vt., New Ulm, Minn., and Salt Lake City, 9; Corning, Mo., Davenport, Ia., 8.4; Dyberry, Pa., Auburn, N. H., Geneseo, Ill., Buffalo and Friendship, N. Y., 8.

DEPTH OF SNOW ON GROUND AT END OF MONTH.

Colorado: Pike's Peak, 12 inches
Dakota: Fort Stevenson, 1 inch.
Maine: Gardiner, 15 inches; Orono, 2 inches; Portland, trace.
Minnesota: St. Vincent, 13 inches; Moorhead, 6 inches.
New Hampshire: Mt. Washington, 41 inches; Auburn, 1 to 2 inches.
New York: Waterburg, traces in sheltered places; Friendship and Itheca, trace.
Pennsylvania: Dyberry, patches in protected places.
Vermont: Burlington, trace.
Wisconsin: trace.

RAIN OR SNOW FROM A CLOUDLESS SKY.

Baltimore, 22d, 7.15 to 7.25 p. m., light snow from an apparently cloudless sky. Woodstock, Maryland, 15th, 9.30 p. m., rain from a perfectly cloudless sky.

HAIL.

Lynchburg, Va., 8th, 4.50 p. m., light shower of hail. Charlotte, N. C., 28th, 5.20 p. m., small hail-stones size of peas. A heavy hail storm which did a good deal of damage to wheat, is reported to have occurred at the same time north of the city. Jacksonville, Fla., 1st, small hail. Denison, Tex., 8th, 6.15 p. m., small hail lasting one minute. Little Rock, Ark., 15th, 1.55 p. m., small hail began falling and was soon followed by a heavy hail-storm; stones measured three-fourths of an inch in diameter and were almost perfectly spherical in form; storm ended at 2.05 p. m.; hail also fell on 27th and 31st. Mason, Tex., 26th, scattering hail of large size fell during thunderstorm. Nashville, Tenn., 17th, 6.37 to 6.40 p. m., hail of considerable size. Cincinnati, Ohio, 27th, 2.30 p. m., hail size of peas, lasting two minutes; 27th, a few large hail-stones fell between 1.20 and 2.10 p. m. Duluth, Minn., 4th, a heavy fall of hail is reported to have occurred at New London, four miles south of station. Keokuk, Ia., 7th, 8 to 8.10 p. m., hail-stones three-eighths of an inch in diameter. Omaha, 26th, 1.15 p. m., copious shower of hail, size of peas, lasting three minutes. Springfield, Mo., 12th, 11.30 a. m. to 12.10 p. m.; 15th, 12.10 to 12.45 p. m. Huron Dak., 4th, hail-stones size of hazel-nuts. Colfax, Wash. Ty., 3d, heavy hail-storm from 4 to 4.15 p. m. Sacramento, Cal., 17th, 18th, small hail. Roseburg, Or., 2d, 15th, 18th, small hail. Portland, Or., 9th, 4.57 p. m., brisk shower of hail lasting 10 minutes. Point San Jose, Cal., 12th, 4 p. m. Alexandria, Dak., 4th; Forsyth, Ga., 27th, slight fall of hail. Vevay, Ind., 18th, 1 to 2 p. m., hail lasting 5 minutes; stones measuring from one-fourth to one-half inch in diameter. 27th, noon, severest hail-storm ever witnessed in this locality; at 12.07 p. m., stones one-fourth inch in diameter began falling; they rapidly increased in size varying from one to one and three-fourth inches in diameter. The largest weighing 12 pwts. troy, and were corrugated and lozenge shaped. Many windows were broken and much damage was done to shrubbery and to wheat fields. The duration of the storm was four minutes. Charleston, Ill., 17th, from 11.40 to 11.42 a. m., and from 2.23 to 2.24 p. m., hail stones the size of common bullets. Swanwick, Ill., 20th. Morrison, Ill., 25th. Ft. Wayne, Ind., 7th. In-

dependence, Ia., 17th, 6 to 8 a. m., severe hail storm. Cresco, Ia., 4th, 17th. Guttenburg, Ia., 4th, 25th. Nora Springs, Ia., 4th, 25th. Cedar Rapids, Ia., 4th, 12th, 25th. Holton, Kan., 26th. Yates Centre, Kan., 8th. Gardiner, Me., 10th, 30th. Falston, Md., 21st. Deer Park, Md., 15th. Fall River, Mass., 3d. Kalamazoo, Mich, 4th. Niles, Mich., 5th. Northport, Mich., 2d, 5.30, p. m., hail storm lasting five minutes, nearly covering the ground with stones as large as buck-shot. New Ulm, Minn., 16th. Corning, Mo., 26th, an excessive rain and hail storm visited the section of country about 20 miles north of this place. It is reported by the Atchison county papers that hail in some places drifted to depths of three and one half feet. Only the edge of the storm passed over this place. Protem, Mo., 31st, 3 a. m., heavy hail seven miles southeast of station, doing much injury to fruit trees and gardens. Lincoln, Neb., 26th. Freehold, N. J., 28th. Princeton, N. J., 9th. Fayetteville, N. C., 1st. Bellefontaine, O., 26th. Bethel, College Hill, Westerville and Wooster, Ohio, 27th. Jacksonburg, Ohio, 14th, 18th, 27th. New Athens, Ohio, 27th, 2.30 p. m., hail storm passed over station in an easterly direction. Twenty miles east of Wheeling, W. Va., considerable damage was done to windows. Dybury, Pa., 8th, 21st. Wellsboro, Pa., 9th, 18th. Meadville, Pa., 27th. Stateburg, S. C., 1st. Austin, Tenn., 17th, 28th. Murfreesboro, Tenn., 17th, 26th. Clarksville, Texas, 5th, 8th. Wytheville, Va., 15th. Franklin, Wis., 4th, 17th. Ft. Myer, Va., 8th. Castroville, Texas, 22d. Louisville, 27th. Logansport, Ind., 17th. Indianapolis, 15th. Milwaukee, 25th. Alpena, Mich., 15th. Burlington, Iowa, 7th, 8.15 p. m., hail as large as peas, lasting one minute. Des Moines, 14th, 17th. St. Paul, 4th, 20th. Madison, Wis., 4th. Davenport, Iowa, 17th. Fort Missoula, Mont., 16th, 17th. Deadwood, Dak., 26th. Fort Assinnaboine, Mont., 1st. Griffin, Tex., 6th, 8th. Ft. Cummings, N. M., 25th, 26th. San Carlos, Ariz., 26th. Tucson, Ariz, 25th, 26th. Silver City, N. M., 7th. Winnemucca, Nev., 15th. Dayton, Wash. Ty., 17th. Umatilla, Or., 18th. Colfax, Wash. Ty., 3d, 17th, 19th. San Francisco, 15th, 16th, 19th. Des Moines, Ia., 14th, hail lasting fourteen minutes. Murfreesboro, Tenn., 17th, a severe hail storm passed over Rutherford and Cannon counties about 7 a. m. The course of the storm was a little south of east. In some places in Rutherford county, hail fell to a depth of eight inches and the stones were unusually large.

SLEET.

The dates on which sleet fell in the various districts are as follows: New England, 1st, 4th, 5th, 6th, 10th, 11th, 18th, 19th, 21st, 26th, 27th; Middle Atlantic states, 8th, 9th, 15th, 17th, 18th, 19th, 21st, 22d, 27th; Ohio valley, 4th, 10th; upper lake region, 2d, 4th to 9th, 14th, 17th, 18th, 20th, 21st, 26th; Upper Mississippi valley, 8th, 9th, 10th, 13th, 14th, 20th, 23d, 25th; Missouri valley, 8th, 9th, 12th; southern slope, 5th to 9th; northern slope, 25th, 26th; middle plateau, 6th, 15th, 21st. Sleet was also reported from the following stations not included in the districts named above: Ft. Porter, N. Y., 21st; Ft. Stevenson, Dak., 14th; Ft. Supply, Ind. Ty., 7th; Umatilla, 18th. Unusually severe storms have been reported as follows: Coleman City, Tex., during sleet storm on 7th, 8th, ice on telegraph lines accumulated to the thickness of two inches; several iron poles were bent over by the weight and many trees broken. Graham, Tex., 5th to 8th, prostrating telegraph wire. Henrietta, Tex., 7th, ice on telegraph line one and a quarter inches thick; much damage done.

RELATIVE HUMIDITY.

The mean relative humidity for the month ranges as follows in the several districts:

New England, from 64 to 79; Middle Atlantic states, 58 to 79; South Atlantic states, 61 to 79; Florida peninsula, 69 to 72; East Gulf states, 66 to 78; West Gulf states, 57 to 83; Rio Grande valley, 71 to 84; Ohio valley and Tennessee, 60 to 71; lower lake region, 69 to 78; upper lake region, 73 to 80; extreme northwest, 69 to 90; Upper Mississippi valley, 62 to 75; Missouri valley, 60 to 72; northern slope, 54 to 69; middle slope, 40 to 56; southern slope, 41 to 74; southern plateau, 36 to 51; middle plateau, 50 to 65; northern plateau, 60 to 79; North Pacific coast region, 74 to 78; Middle Pacific coast region, 62 to 79; South Pacific coast region, 37 to 72. High stations report the following percentages not corrected for altitude: Cheyenne, Wyo., 41.9; Pike's Peak, 81.0; Santa Fe, 37.3; Mt. Washington, 84.6.

WINDS.

The prevailing winds during the month of March at Signal Service stations are shown on chart ii. by arrows flying with the wind. On the New England and Middle Atlantic coasts and over lakes Ontario, Huron and Michigan the winds are northwesterly; in the South Atlantic states, southwesterly; in the Gulf states, Tennessee, Indian territory and northern Texas, southerly; in the Upper Mississippi and Lower Missouri valleys, northwesterly; in the plateau regions, variable, but mostly from south to west; in California, westerly to northwesterly; North Pacific coast region, southerly.

TOTAL MOVEMENTS OF THE AIR.

The following are the largest total movements at Signal Service stations: Mount Washington, 26,488 miles: Pike's Peak, 19,552; Delaware Breakwater, 14,345; New Shoreham, R. I., 13,887; Portsmouth, N. C., 13,686; Hatteras, N. C., 13,356; Kittyhawk, N. C., 12,840; Sandy Hook, 12,741; Champaign, Ill., 12,433; Sandusky, 12,314; Cape May, N. J., 11,807; Indianola, Tex., 11,616; Barnegat, N. J., 11,532; Huron, Dak., 11,300; Cape Henry, Va., 10,953; Milwaukee, 10,641; Macon, N. C., 10,447; Cheyenne, Wyo., 10,339; Moorhead, Minn., 10,215; Grand Haven, Mich., 10,182; Provincetown, Mass., 10,062; Dodge City, Kan., 10,031; St. Vincent, Minn., 10,009; Omaha, 10,002; Rochester, 9,938; Fort Shaw, Mont., 9,857; Fort Elliott, Tex., 9.839; Eastport, 9,794; North Platte, 9,495; Boston, 9,425; Fort Myer, Va., 9,258; Davenport, 8,960; Erie and St. Louis, 8,950; Alpena, Mich., 8,908; Bismarck, Dak., 8,887; Newport, R. I., 8,875; Buffalo, 8,811; Detroit, 8,800; Cleveland, 8,776; Fort Assinnaboine, Mont., 8,768; Galveston, 8,668; Springfield, Mo., 8,618; Eagle Rock, Idaho, 8,609; Fort Benton, Mont., 8,429; Columbus, O., 8,250; Port Eads, La., 8,248; Atlantic City, N. J., 8,190; New York city, 8,176; Springfield, Ill., 8,157; Louisville, 8,128; Smithville, N. C., 8,093; Oswego, 8,052; Toledo, 8,019; Fort Buford, Dak, 8,008; Umatilla, Or., 8,002. The smallest are: Roseburg, Or., 2,279; Uvalde, Tex., 2,732; La Mesilla, N. M., 2,757; Phoenix, Ariz., 2,848.

HIGH WINDS.

On the summit of Mount Washington, the maximum velocity, 118 miles, n.w., occurred on the 24th. Velocities of 75 miles per hour, or over, occurred as follows: 114 miles, s., 1st; 91, n.w., 4th; 100, s.w., 9th; 108, n.w., 20th; 90, n.w., 21st; 118, n.w., 24th; 75 n.w., 25th; 93, s.w., 27th; 92, s.w., 28th; 90, n.w., 31st. On all other dates during the month, velocities reached or exceeded 50 miles per hour, with the exception of 5th, 12th, 15th, 16th, 17th, 22d. On the summit of Pike's Peak, Col., the maximum velocity 92 miles, n., occurred on 20th. Other high velocities occurred as follows: 60, n.w., 1st; 60, s.w., 3d; 58, s.w., 4th; 58, s.w., 10th; 56, s.w., 11th; 58, s.w., 16th; 60, s.w., 17th; 50, s.w., 19th; 78, n., 21st; 62, s.w., 25th; 62, n.w., 28th; 66, n.w., 29th. Other stations reporting velocities of 50 miles per hour, or over, are as follows: Umatilla, Or., 52, w., 28th; Ft. Assinnaboine, Mont., 56, w., 28th; Ft. Benton, Mont., 50, w., 1st; Ft. Shaw, Mont., 51, s.w., 27th and 57, s.w., 28th; Helena, Mont., 56, s.w., 28th; Ft. Custer, Mont., 64, w., 28th; Ft. Keogh, Mont., 50, w., 28th; Cheyenne, Wyo., 52, nw., 28th; Ft. Washakie, Wyo., 60, w., 28th; Huron, Dak., 50, n.w., 5th and 66, n.w., 20th; Palestine, Tex., 60, s., 18th; Indianola, Tex., 53, n., 21st; Rochester, N. Y., 50, n., 21st; Columbus, Ohio, 54, w., 21st; Champaign, Ill., 50, s.w., 9th; Del. Breakwater, Del., 52, s.e., 1st; Cape Henry, Va., 52, n.w., 13th; Kittyhawk, N. C., 50, n., 24th.

LOCAL STORMS.

Savannah, Ga., 28th, during the morning, a tornado passed through the counties of Effingham, Washington, Bibb and Randolph of this state. Its track was about half a mile wide, and it passed from west to east. Several lives were lost; trees, fences, houses and telegraph poles were blown down. Columbus, O., 21st, severest storm experienced for years, passed over city at 5 a. m. The wind continued to blow a gale all day; maximum velocity, 54 miles, w., was reached at 5.15 p. m. A large number of buildings in course of construction, were damaged; out-houses, fences, signs, etc., were blown down. Cleveland, 9th, 8.35 p. m., during a severe storm, St. Mary's Catholic church was unroofed; a store on Broadway had its front blown in and considerable other damage of minor nature was done in the city; 27th, severe storm; between 12.30 and 1 p. m., rain fell torrents. A new frame building was blown over and crushed; another was moved two feet from its foundation; a frame store was also blown down; trees were uprooted, windows broken, and lumber piles were scattered. A high wall, the ruins of a recently burned building, was blown down, crushing through the roof of the adjoining building to the cellar and competely wrecking it. Sandusky, 27th, 9 p. m., heavy, inky clouds came up from northwest, accompanied by lightning and thunder. As the storm approached, it moved around to the northward and apparently only the edge of it touched the city. At Kelly's Island, much damage was done to a building in course of construction. Buffalo, 27th, severe storm reported from localities south of station; considerable damage was done.

St. Louis, 21st, one of the fiercest gales that has ever visited this city; the wind blew in violent puffs; maximum velocity 42 miles; very little damage was done.

Springfield, Ill., 21st; strong gale; a house in course of construction and nearly completed was entirely demolished; a few others were unroofed and many others were blown down.

Omaha, 20th, severe gale; several signs were torn from their fastenings; a wagon was upset in the street.

Fort. Washakie, Wyo., 28th, very severe gale; fences, outhouses, etc., were blown down; some new stables had roofs blown off. The Signal Service instrument shelter was badly damaged. This storm is considered by the inhabitants to have been the severest experienced for many years.

Fort Custer, Mont., 28th, gale from the west, maximum velocity 64 miles at 4.15 p. m. The sky was completely obscured by clouds of dust and pebbles. The west end of the post hospital was demolished and carried fifty yards. The porch of the barracks was thrown by the wind on the roof of the building; outhouses were overturned and fences blown down.

St. Meinrad, Ind., 27th, violent gale; many forest and fruit trees blown down.

Fort. Wayne, Ind., 20th, 10.30 to 11.30 p. m., severe storm; buildings, fences, etc., blown down.

St. Louis, Missouri Weather Service reports: at 3 p. m., on the 26th, a small tornado formed a short distance southwest of Hamansville, Polk county, and passed north of east through Elkton, Hickory county. Several houses were destroyed; no lives were lost, but in some cases severe injuries were inflicted.

New Haven, Conn., 4th, strong gale; trees, fences and signs blown down.

Monroe, La., 26th, violent hurricane, doing much damage; several gin-houses and cabins were destroyed; damage estimated at $25,000; several negroes reported killed.

Reports from counties in southern Alabama and Georgia show that a violent and destructive tornado occurred in that section on the night of the 27th. In Butler county, Ala., some fifteen or twenty residences were either unroofed or entirely destroyed; a number of persons were more or less injured. The tornado passed through the upper part of Henry county between 9 and 10 oclock. A farmer living in the track of the storm was instantly killed by the falling timbers of his house, and his wife seriously, if not fatally injured. On this and other farms westward there was a total destruction of all the dwellings, gin-houses and engine works. In Dallas county, the storm was especially destructive. In a small place called Liberty Hill, every building is reported to have been destroyed, and a number of persons killed. On plantations lying east, south, and west of Selma, houses were blown to pieces, trees uprooted, fences blown down, and general destruction was caused by the terrific force of the wind. In East Selma a number of large buildings were demolished. In Black Creek bottom numerous trees were broken, their trunks being carried many feet, and the boughs taken up and deposited in fields hundreds of yards distant. In the East Selma cemeteries great damage was done to the monuments and shade trees; shrubbery and fences were laid low. In Barbour county, Ala., the track of the tornado was about a mile in width. It literally swept everything before it; trees, fences and houses—leaving them in utter ruin. In this county one man was killed and several were seriously injured. On one farm every house was blown away; on another all the buildings with the exception of the residence were destroyed. Many other farms suffered to a greater or less extent. A Methodist church at White Pond was torn to pieces, even the sills upon which it stood were removed. In Richards' settlement several lives were lost and many persons were injured. The baggage and passenger cars on the Clayton railroad were thrown from the track, and wrecked. The southwestern part of Lee county suffered considerable damage; many residences were completely destroyed; several lives were lost, and many persons were injured more or less seriously; one man was instantly killed. The tornado crossed the track of the Southwestern railroad within three-quarters of a mile of the town of Smithville, Ga. In this vicinity hundreds of tall and massive pines were uprooted, and fences in the neighborhood were leveled. On a plantation three cabins were entirely demolished while a fourth, distant about one hundred yards, remained intact. The dwelling on this place, a strongly built two-story frame structure, had the part facing the east together with attached sheds entirely demolished, while the front, though severely wrenched, remained standing. The owner of this dwelling, states that he noticed a great stillness and warmth in the atmosphere at 11 p. m. About half an hour later he heard a roaring, rushing sound, similar to that of several trains passing at full speed. In a few minutes vivid flashes of lightning followed each other in rapid succession; then large hail-stones began to fall; the roar increased; the house began swaying and in a few moments came down with a crash. The occupants narrowly escaped with their lives to a cabin about a hundred yards distant. At this time rain was falling in torrents, accompanied by such rapid flashes of lightning as to be almost continuous. The stock of the plantation was dispersed. A strong log hut about twenty yards northward of the dwelling was crushed, while a light frame structure about fifteen yards southeast was not harmed. A colored man on a neighboring plantation was killed by lightning. At this point the track of the tornado was about half a mile wide and its course a little north of east. Most of the trees blown down on the southern edge, lay about southeast and northwest, their tops pointing to the southeast; on the northern edge some were noticed to lay with tops to north and northwest and others just the reverse. It was also noticed that in some places the trees were twisted off and uprooted, pointing in every direction, some apparently sucked in, others blown outward. One observer claims to have witnessed the funnel shape of the roaring mass, and states that, by the aid of the incessant lightning, tree tops, planks, and debris could be seen whirling around at a great height; in places some tall trees within a short space of the immediate track had only their tops taken off, while in others trees were torn up by the roots. The path of the tornado clearly showed the bounding nature of the whirling mass and that it did not cling closely to the earth. Right in the track, a clump of trees, a line of fence,

or a house, would remain untouched, while to the east or west everything would be swept clean. In some places an upward and downward curve could be detected in its course; here a mass of trees were leveled to the ground, and there a cluster with only their tops broken off. Reports from Bulloch county show the tornado to have passed over a portion of that county, sweeping nearly everything in its path. At Sandersville, Ga.. on the 27th, a tornado passed over the county about 11 a. m., causing much destruction. A number of persons were seriously injured by the blowing down of houses. A school house, at Whidden settlement, was blown down, the teacher and several children were injured. With the exception of the destruction of some fencing and shade trees, Sandersville escaped. At Raynesboro, Ga., 27th, a destructive wind swept over the county, four or five miles northeast of this place. Within the path of this storm a house was blown to pieces, killing one child. No other personal injury is reported, although houses are said to have been destroyed on every plantation within its course. All the public roads are seriouly obstructed by fallen trees. Macon, Ga., 27th, a tornado did considerable damage to property near here, and along the railroad as far as Sandersville, dwellings, barns, gin-houses, cabins, and trees were destroyed. No fatal accidents are reported. The tornado was very violent and its track was about a thousand yards wide; it moved from west to east.

VERIFICATIONS.

INDICATIONS.

The detailed comparison of the tri-daily indications for March, 1882, with the telegraphic reports for the succeeding twenty-four hours, shows the general average percentage of verifications to be 86.66 per cent. The percentages for the four elements are: Weather, 81.91; Direction of the Wind, 83.33; Temperature, 90.46; Barometer, 90.86 per cent. By geographical districts they are: For New England, 86.56; Middle Atlantic states, 89.89; South Atlantic states, 86.36; East Gulf states, 83.77; West Gulf states, 81.92; Lower Lake region, 89.06; Upper Lake region, 88.59; Tennessee and the Ohio valley, 91.36; Upper Mississippi valley, 86.43; Lower Missouri valley, 80.48: Northern Pacific coast region, 81.94; Middle Pacific coast region, 93.14; Southern Pacific coast region, 93.14.

There were 88 omissions to predict (31 being due to the absence of reports from the Pacific coast) out of 3,813, or 2.30 per cent. Of the 3,725 predictions that have been made, 143, or 3.84 per cent., are considered to have entirely failed; 148, or 3.98 per cent., were one-fourth verified; 395, or 10.60 per cent., were one-half verified; 207, or 5.56 per cent., were three-fourths verified; 2,832, or 76.02 per cent., were fully justified, so far as can be ascertained by the tri-daily reports.

CAUTIONARY SIGNALS.

One hundred and seventy-four Cautionary signals were displayed during the month of March, of which 162, or 93. per cent., were justified by winds of twenty-five miles per hour, at, or within, 100 miles of the station. Sixty-four "Off-shore" signals were displayed, of which 55, or 86 per cent., were fully justified; 58, or 90 per cent., were justified as to direction; and 61, or 95 per cent., were justified as to velocity. Two hundred and thirty-eight signals of all kinds were displayed, of which 217, or 92 per cent., were justified. Twenty-five Cautionary signals were changed to "Off-shore" signals. The above does not include signals ordered at sixty-nine display stations, where the velocity is estimated only. Twenty-nine signals were reported late.

NAVIGATION.

STAGE OF WATER IN RIVERS.

In the table on tne right-hand of chart iii., are given the highest and lowest stages of water, as observed at Signal Service stations, during the month of March. At stations on the Mississippi it will be seen that the water remains above the danger-line at Cairo and Vicksburg, and is only four inches below the danger line at Memphis. The readings of the highest water during the month at stations on the lower Mississippi, were as follows:

Cairo, fifty-one ft., on the 1st, or eleven feet above the danger-line. Memphis, thirty-six ft., on the 6th, 7th, 9th. Vicksburg, forty-eight ft., nine ins., on 20th, or eight ft., nine ins., above the danger-line. The highest at New Orleans, occurred on the 27th, when it was but five inches below the high-water mark of 1874. The Red river was highest at Shreveport on the 10th, 11th, 12th, when it was thirty-one feet one inch, or one foot above the danger-line; it was lowest on the 31st. The Ohio river rose during the latter part of the month, but did not reach the danger-line; it was highest at Cincinnati on the 25th, at Louisville on the 26th, an Pittsburgh, on the 22d. The Cumberland was highest at Nashville on the 11th and 13th, when it was three feet nine inches above the danger-line. The upper Mississippi rose slowly during the month, between La Crosse and St. Louis, and was highest at Keokuk and Davenport on the 31st.

ICE IN RIVERS AND HARBORS.

Hudson River: Albany, 1st, ice broke up in river; 3d, river free of ice. First steamer of season left this city for New Baltimore, to-day; 5th, river free of ice from Troy to New York; navigation practically open for this season; 10th, first arrival by river from New York. New York City, 9th, navigation opened; first steamer from Troy arrived to-day.

Mohawk River: Albany, 1st, ice broke up in river and passed this city this evening.

Connecticut River: Springfield, Mass., 2d, floating ice in river. 3d, river clear of ice.

Genesee River: Rochester, 28th, first boat of season arrived to-day.

Detroit River: Detroit, 2d, ice along shore in river; 13th, steamer "City of Detroit," left for Cleveland; first departure of season.

Lake Erie: Buffalo, 26th, the propeller "New York," arrived from Cleveland; the earliest arrival for many years.

St. Lawrence River: Cape Vincent, N. Y., 3d, ice breaking up and going out of river and lake at this place.

Lake Superior: Marquette, 3d, ice moved out of harbor; 4th, ice moved back into harbor. Duluth, Minn., 1st, all ice went out into the lake during the night; 4th, ice driven back during the evening; 5th, lake filled with ice; 10th, ice moved out about one fourth mile; 18th, ice moved out about one-half mile; navigation resumed; tugs with freight and passengers left for northern ports; 20th, ice driven back again, damaging the old breakwater.

Lake Michigan: Milwaukee, 8th, navigation practically open. Northport, 31st, no ice to be seen in lake; navigation fairly open.

Manitowoc River: Manitowoc, Wis., 4th, ice broke in river; 7th, river frozen; 15th, river open.

Lake Huron: Alpena, 2d, ice broken in bay and river; navigation open. Port Huron, 23d, steamer "Flora," left city this a. m. for northern ports; the earliest departure for years.

Yellowstone River: Fort Buford, Dak., 29th, ice broke in river at 10 p. m. Fort Keogh, Mont., 28th, river open. Terry's Landing, 25th, river open; 26th, ice gorged in shallow places. Foley, Montana, 28th, ice broke in river during night. Iron Butte, 29th, ice broke in Upper Yellowstone to day, sweeping out about 100 feet of Northern Pacific Dyke.

Mississippi River: Burlington, 4th, navigation opened; first boat of season passed city at 5.45 p. m.; 11th, first passenger steamer from St. Louis touched this city on her upward trip to La Crosse. Keokuk, 6th, navigation open; first raft of season passed to-day; 18th, first northward bound steamer passed to-day. La Crosse, 3d, river opened; 4th, navigation resumed; steamer arrived from Fountain City; ferry boats making regu-

lar trips. St. Paul, 9th, ice broken in places; 23d, ice breaking up in river and moving down stream; 24th, ice gorge in river; 26th, ice gorge at 6.30 p. m.; 27th, 29th, river full of floating ice.

Missouri River: Yankton, 4th, ice broke in river; 8th, river frozen; 17th, ice broke in river. Leavenworth, 9th to 12th, slush ice in river; 13th, river clear of ice; 26th, steamer "Red Cloud" from St. Louis to Fort Benton passed to-day.

Tongue River: Fort Keogh, Mont., 25th, ice broke in river.

Powder River: Foley, Montana, 24th, ice broke in river at eight a. m.

Cobossee River: Gardiner, Me., 28th, a. m., ice started from mouth of river above the bridge. 29th, river clear of ice to cove 1½ miles below the bridge.

FLOODS.

The excessive rainfall in the central Mississippi and Ohio valleys and in Tennessee, during the month, has caused a continuation of the damaging floods, especially in the Mississippi valley south of Cairo. At this station the water was fifty-one feet on the gauge on March 1st. This is eleven feet above the danger line. The observer at that station reports that the Mississippi and Ohio remained above the level in places until March 2d. After that they began to recede from the top of the city's embankments. An overflow was prevented only by the construction of a bulk-head on the top of the levee, and extending it around the city. This bulk-head was constructed by driving short stakes into the earth at intervals of six feet, and nailing planks to the uprights. Against this an embankment of earth was thrown on the side from the river. The sipe-water referred to in February report continued to rise until the 22d, when it reached its maximum, the highest ever known, almost the whole city being under water. On the 27th of March, the water had fallen to forty-one feet and one inch on the gauge, and was low enough to permit of the opening of the sewers. The damage done in the inundated region is much greater than was at first estimated. All railroads leading from the city were under water; passengers leaving the city were compelled to take passage in boats in order to reach the trains. About four thousand sufferers in Alexandria and Pulaski counties have received rations issued by the government. The observer at Memphis reports, on the 6th, the river is thirty-six feet above low water of 1872, which is the highest on record; 7th and 9th, river thirty-six feet; 10th, river falling slowly. Reports indicate that the present flood in the lower Mississippi is more extensive and destructive than the floods of 1862, '67 and '74. The river ranges from ten to twenty miles in width from Cairo southward to New Orleans; but the region of greatest damage lies between Vicksburg and Memphis. The observer at Vicksburg reports: 12th, river rising; levee on Louisiana side of river opposite station and protecting Delta, La., is in imminent danger of being broken; 13th, river rising; much distress reported from Yazoo and Sunflower valleys above station; entire country overflowed; 14th, river very high; lower Levee street under water; refugees from overflowed districts arriving in city; 15th, river still rising; levee on opposite side of river gone; break one hundred and fifty yards wide; a few houses were swept away. The river reached its maximum height, forty-eight feet, nine inches on the 20th; 21st, river falling. Reports from White river, Clarendon, Ark., state that the back water from the Mississippi extends to a distance of a hundred and thirty-five miles, and that the entire country intervening is under water. The river is two feet higher than was ever known before. The river reached its highest point at New Orleans on the 27th, when it was five inches below the high water mark of 1874.

The overflow in Concordia parish extends from the Black to the Mississippi rivers, a distance of thirty-five miles; in Tensas parish, from Tensas river and Bayou Macon to the Mississippi river, a distance of thirty miles; in Franklin parish, from Tensas west to the Ovachita river, a distance of ten miles; in Madison parish from Bayou Macon to the Mississippi river, a distance of thirty-five miles; in East Carroll parish from Bayou Macon to the Mississippi river, ten miles. The flood extends to the Ovachita river, a distance of fifteen miles. The Tensas river, since Saturday, has risen five feet, and is still rising at the rate of eleven inches in twenty-four hours. Along the Tensas and Bayou Macon the water is three feet higher than in 1875, and the unprecedented flow is accounted for by the breaks in the levees at Milliken's Bend and Goodrich Landing. Natchez, Miss., 24th, reports from the Tensas river and its tributaries are more distressing every day. The water is two and a half feet higher than in 1874, and is rising at the rate of five inches in twenty-four hours. Reports from Yazoo City, 15th, state that the water rose in the river six and a half inches in the past twenty-four hours, while the backwater is rising more rapidly. The current of the Yazoo is running up stream to Satartia, twenty-four miles below here. Greenwood, two hundred miles above here, is covered with water, and the last boat brought the news that the citizens, white and black, were taking refuge on the second floor of the court-house. Greenwood was not covered by the overflow of 1867. Reports from Fort Adams, Miss., 15th, state that there has been for several weeks a continued rise of the river at this point, of from three to four inches every twenty-four hours, up to Sunday, the 12th instant, when it reached the high-water mark of 1874. Since then the rise has been partially checked, being only one inch in the last twenty-four hours. The river is now about four inches above the high-water mark of 1874. The prospects for crops in the hills are not as promising as they might be. Work is very backward, owing to the continued rains. Farmers have had but very little good weather to prepare for planting, and the general outlook is rather gloomy. A despatch from Yazoo City on the 18th makes the startling announcement that the water at that point is higher now than in 1867. Following the course of the river the distance from Vicksburg to Coldwater, is about four hundred and fifty miles. The entire country contiguous is swamp lands. In width it is probably sixty miles, and this is known as the Yazoo Delta, which is bounded on the east by the hills and on the west by the Mississippi river. The low-lands are entirely submerged, with the exception of a few knolls or Indian mounds at long intervals, on which the stock and people are gathered where they are accessible.

The rains, together with the unusual volume of water from the Mississippi river flowing through the breaks into the tributary streams, the principal of which are the Coldwater, Tallahatchie, Yazoo, Sunflower, Big and Little Deer creek, and many others of less note have caused them to be swollen beyond precedent. In the meantime the people are totally unprepared to protect themselves or property, hence the losses are simply beyond estimate. Loss of life has not been large, but the loss of cattle and stock and provisions, agricultural implements pertaining to culture of cotton has been great beyond comparison. Reports from Helena, Ark., on the 18th, state that the destitution now prevailing in the sunken lands of the upper St. Francis was never equalled. The Tyronga, a small river running out of the St. Francis, with Little river and other points are thickly settled with whites, who are on rafts, scaffolds and logs. Families are huddled together like animals, praying for food. For a distance of three hundred miles, no land is to be seen. The river continues falling at Helena, but the overflows in the city remains about the same. Captain Gordon Webster, of Indian Bay, Ark., one hundred miles up White river, arrived at Memphis on the 7th, and reports as follows: The water there is thirty-five inches higher than ever before; this is attributed to the backwater from Helena, a large volume of which rushes across the low country and assists in filling the whole intervening swamps. Indian Bay is deserted by all except one family, who are encamped on Indian mounds, others having sought quarters on the bluffs of St. Charles or adjacent hills. More than half of the stock belonging to the people of Monroe county has been lost, and from five to six

hundred residents are destitute and need immediate assistance. Several fields of recently planted corn are covered with from nine to twelve feet of water. Reports received from Lake Providence, La., 25th, state that the break in the levee at Alsalia, below Lake Providence, widens; there are three breaks between Alsalia and Goodrich's Landing, and four between Goodrich's and the Raleigh Place. The breaks are from one hundred to eight hundred yards wide, and increasing. The country from Melbourne down is all under water to depths from six to eight feet; it extends back for miles. There has been an immense loss of stock and household goods. No attention was paid to saving property when the break occurred, as it was a matter of life and death. It required every effort to save human life. The whole day is being spent in rescuing people. Many are in danger for want of boats to rescue them. Several children and men were drowned. The loss of life and property cannot be ascertained. Helena, Ark., 25th, river fell two inches to-day and the overflow in the city is about the same. Lieutenants Satterlee and Richards, detailed by the Secretary of War to examine into the condition of affairs here, report much destruction below and in the interior. The Ohio river reached its highest point at Cincinnati on 25th, when it was three feet below the danger-line or forty-seven feet on the gauge. The observer at Cincinnati, on the 20th, reports very heavy rains, causing rivers and streams to rise suddenly. Several coal barges broke from their moorings and a number of small bridges were carried away. The Cumberland river, at Nashville, was forty-five feet nine inches on the guage from the 11th to 13th, or three feet nine inches above the danger-line. The observer at that station reports on the 6th, river rose fourteen feet four inches in twenty-four hours; 9th, river rose six feet four inches in twenty-four hours, and is seven inches above the danger-line; no damage reported; 10th, river three feet five inches above the danger-line. The river continued at this point above the danger-line until after the 15th. The heavy rains in northern Alabama, between the 6th and 10th, caused the Tennessee to overflow its banks near Chattanooga, resulting in considerable damage to railroad embankments. The Red river, at Shreveport, was highest on the 10th, 11th and 12th, where it was thirty-one feet one inch on the gauge, or one foot four inches above the danger-line

HIGH TIDES.

Boston, 19th; New Shoreham, R. I., 18th; Delaware Breakwater, 19th; Little Egg Harbor, N. J., 17th, 18th; Flushing, N. Y., 16th.

TEMPERATURE OF WATER.

The temperature of water as observed in rivers and harbors at Signal Service stations, with the average depth at which the observations were taken, is given in the table on the right hand of chart ii. Observations on temperature of water were not taken on the following dates and at the following stations on account of ice in harbors: Milwaukee, 1st to 6th; Detroit, 2d; Duluth, 5th to 31st; Alpena, 1st; Marquette, 1st, 2d, 4th to 31st; Escanaba, frozen throughout the month; Burlington, Vt., lake frozen throughout the month. It will be seen that the mean of the maximum and minimum temperatures of water, correspond very nearly with the temperature of the air at the stations, as indicated by the isothermal lines on chart ii.

ATMOSPHERIC ELECTRICITY.

AURORAS.

The most widely observed display occurred on the 19th. This remarkable display was observed by stations along the northern boundary of the United States, from Eastport to Oregon, and was reported by the various stations as follows: Eastport, Me., 10.30 p. m. to midnight, faint light in northern sky, extending from northwest to northeast, and to an altitude of 20°; Gardiner, Me., 10.30 p. m. to 3.45 a. m. of 20th, very bright, with beams moving rapidly from east to west; Burlington, Vt., 10 to 11.45 p. m., very brilliant with dark segment low down upon the horizon, bright arch, streamers shooting up to a height of from 20° to 45°, and of greenish color; Boston, 9.30 p. m. to 4 a. m., of 20th, faint auroral band along the horizon, extending 60° azimuth. At 2 a. m. it became very brilliant, with streamers shooting up to an altitude of 30° and moving slowly along the horizon from west to east; Springfield, 11.18 p. m., very faint, consisting of a slight glow and a few faint rays attaining an altitude of 10°. At 2 a. m. it was somewhat brighter, with an occasional faint ray; Albany, 20th, 12.10 a. m., pale yellow auroral light in northern sky; streamers observed at 12.25 and 2.10 a. m.; the sky, bordering the upper limit, was intensely dark; no dark segment beneath; still visible at 3.45 a. m. Harvard College, Cambridge, Mass., first noticed at 9.15 p. m. as a low, faint arch, streamers appeared soon after and were still visible at 11 p. m. Point Judith, R. I., 8 a. m. to midnight, faint auroral light in northern sky. Fall River, Mass., 10 p. m., aurora mainly in the northwest with a few streamers about 30° in length. Rowe, Mass., 10.30 p. m., North Volney, N. Y., 9.15 p. m., faint auroral light in northern sky. Itheca, N.Y., first observed at 9 p. m. as a broad arch of light on northern horizon; at 10 p. m., beams extended upward to a height of 20° and soon disappeared; very faint at 11 p. m. Newport, Vt., during evening. Palermo, N. Y., very bright during evening. Rochester, N. Y., first observed at 9.30 p. m.; maximum brilliancy at 11.45 p. m.; arch of pale yellow 20° in height with an unusually low dark segment; disappeared at daybreak on the morning of 20th. Madison Barracks, N. Y., during evening. Oswego, 19th, 9.45 p. m. to 2 a. m. of 20th, consisting of dark segment surmounted by a diffuse light extending half way to the zenith; very bright at 1 a. m., in northeast with beams extending upward to an altitude of 80°. Alpena, Mich., 9.15 to 11.35 p. m. consisting of a diffused light with a few small streamers. Marquette, Mich., 8.20 p. m., aurora of pale yellow color, with beams having a quick lateral motion reaching an altitude of 45°; disappeared at 10 p. m. Northport, Mich., 8 to 10.30 p. m., extending from northwest to northeast with an arch about 30° in height and bright beams 40° in height. Fort Brady, Mich., 8 p. m., fine auroral display. Northfield, Minn., from dark until 7.30 p. m. Terry's Landing, Mont., during evening. Umatilla, Or., 8.55 to 10 p. m., presented a very bright and luminous appearance, but was partially obscured by clouds. Dayton, Wash. Ty., from 9.10 to 9.35 p. m,, when display was obscured by clouds; it consisted of a pale white light. The next in importance was the display of the 8th, which was reported by numerous stations from Eastport, Me., westward to Bismarck, Dak., and southward to Fort Myer, Va. At many of the stations reporting, the displays were very brilliant and in some instances continued from early evening until the morning of the 9th. Displays of less importance occurred on the 10th, 14th, 15th, 18th, and 20th. At Burlington, Vt., a faint aurora was observed from 10 to 11.45 p. m. of the 4th; at Manitowoc, Wis., from 8 to 8.30 p. m. aurora with beams in northwestern sky; and at Ruggles, Ohio, on the 30th.

ATMOSPHERIC ELECTRICITY INTERFERING WITH TELEGRAPHIC COMMUNICATION.

Castroville, Tex., 6th, 7:32 p. m., a flash of lightning damaged the lightning arrester by burning the points. The report of thunder, which was very heavy was preceded by a sound resembling the discharge of a pistol. Bismarck, Dak., 19th. Rapid City, Dak., 4th, atmosphere so charged with electricity as to necessitate the cutting out of instruments. Fort Sully, Dak., 5th. Deadwood, Dak., 4th, a severe electric storm raged among the hills and on the plains. At times an electric charge would enter the office and appear as large luminous balls on the switch-board binding-screws. About 4:30 p. m., while the line was uninterrupted and working well, a peculiar hissing noise was audible for a few seconds, followed immediately by a loud crash, when the entire switch board was enveloped in flames. No damage was done to the

instrument, but the insulation in the "cut-out" was consumed; 5th, the electric charges entered the office several times during the day, exhibiting the same peculiarities as on the 4th. Jacksboro', Tex., 25th. Stockton, Tex., 15th, 16th, 24th. Fort Quitman, Tex., 24th, 25th, during thunder-storms, compelled to cut out instruments. Dayton, Wash. Ty., 16th, 5 p. m., during rain storm, the telegraph wires were so powerfully charged with electricity from a passing cloud that the line could be worked between Dayton and Pomeroy without the aid of a battery. Umatilla, Or., 28th, air so charged with electricity that a shock could be felt by touching the stone pipe on telegraph wire. Fort Yates, Dak., 4th, electric storm.

THUNDER STORMS.

There were reported in the various districts on the following dates:

Middle Atlantic States: 12th, 15th, 18th, 20th, 27th.

South Atlantic States: 1st, 6th, 10th, 12th, 15th, 16th, 27th, 28th.

Florida Peninsula: 1st.

East Gulf States. 6th to 9th, 12th, 15th, 16th, 18th, 21st, 26th, 27th.

West Gulf States: 4th, 5th, 8th, 12th, 15th to 20th, 26th, 27th, 29th, 31st.

Rio Grande Valley: 6th, 7th, 20th.

Ohio Valley and Tennessee: 3d to 6th, 9th, 11th, 14th to 21st, 23d, 25th to 29th.

Lower Lake Region: 15th, 18th, 27th, 29th, 30th.

Upper Lake Region: 4th, 5th, 7th, 17th, 18th, 20th, 25th, 26th, 29th.

Upper Mississippi Valley: 3d, 4th, 5th, 9th, 11th, 12th, 14th, 16th to 25th, 26th, 27th.

Missouri Valley: 3d, 4th, 5th, 7th, 8th, 9th, 11th to 15th, 17th to 20th, 24th to 27th, 31st.

Middle Slope: 23d, 25th, 26th, 27th.

Southern Slope: 5th to 8th, 15th, 16th, 18th, 19th, 20th, 24th, 25th.

Southern Plateau: 24th, 25th.

Middle Pacific Coast Region: 15th, 16th.

They were also reported from the following stations, not included in the above districts: St. Vincent, Minn., 17th; Ft. Sisseton, Dak., 4th; Deadwood, Dak., 4th, 5th; Dayton, Wash. Ty., 1st; San Buenaventura, Cal., 13th.

During thunderstorms, the following instances of damage by lightning occurred: Springfield, Ill., 27th, cow killed by lightning. San Francisco, Cal., 15th, as the pilot boat "Lady Mine" was proceeding to sea, and had reached the bar, she was struck by lightning, and her main-top-mast and main-mast-head, were shivered. This is the first case on record of damage by lightning to a vessel in or near this port. Charleston, Ill., 17th, a hickory tree was struck and shattered. At the fair grounds, one mile west of Court House, a two year old child was knocked insensible. Cresco, Ia., 17th, barn struck by lightning, killing two horses and one cow.

OPTICAL PHENOMENA.

SOLAR HALOS.

Solar halos have been observed in the various districts on the following dates: New England, 2d, 5th, 9th, 11th, 15th, 18th, 20th, 26th, 28th, 29th; Middle Atlantic states, 5th, 6th 7th, 8th, 12th, 15th, 18th, 29th, 31st; South Atlantic states, 9th, 10th, 11th, 17th, 26th; Florida peninsula, 25th, 29th; East Gulf states, 3d, 17th, 19th, 22d, 24th, 25th; West Gulf states, 4th, 11th, 24th; Ohio valley and Tennessee, 2d, 3d, 4th, 6th, 7th, 8th, 11th to 14th, 17th, 18th, 19th, 23d, 24th, 26th, 27th to 31st; lower lake region, 5th, 7th, 8th, 9th, 11th, 14th, 15th, 17th, 20th, 25th, 29th, 31st; upper lake region, 1st, 4th, 11th, 14th, 19th, 28th, 29th; Upper Mississippi valley, 1st, 2d, 4th to 7th, 10th, 11th, 12th, 14th, 18th, 19th, 20th, 23d, 24th, 25th, 27th, 28th, 29th, 30th; Missouri valley, 1st, 5th to 9th, 11th, 13th, 20th, 23d, 24th, 29th; middle slope, 4th, 6th, 14th, 15th, 16th, 20th, 27th, 28th, 29th; northern plateau, 12th, 17th, 20th, 22d, 23d, 25th, 29th; middle plateau, 10th, 22d, 24th, 28th; Middle Pacific coast region, 6th, 12th, 22d to 26th, 28th; South Pacific coast region, 10th, 16th, 18th, 28th. They were also reported from the following stations, not included in the districts named above: St. Vincent, Minn., 30th; Helena, Mont., 27th, 28th; Florence and Tucson, Ariz., 10th; Albany, Or., 12th, 20th, 21st, 23d. Clinton, Ia., 2d, 3 p. m., an unusually conspicuous and brilliant halo of 22° radius was observed. Outside of this there was a part of a halo of much larger radius, while the parhelic circle extended parallel with the horizon, completely around the heavens. Fine parhelia were visible.

LUNAR HALOS.

Have been observed in the various districts on the following dates: New England, 6th, 8th, 9th, 23rd, 25th, 29th; Middle Atlantic states, 1st to 8th, 23d, 25th to 28th, 31st; South Atlantic states, 1st, 25th, 26th, 27th, 29th; Florida peninsula, 1st, 25th, 27th, 28th, 31st; East Gulf states, 22d, 27th, 28th; West Gulf states, 1st, 4th, 9th, 15th, 24th, 25th; Ohio valley and Tennessee, 1st, 3d, 4th, 6th to 9th, 11th, 14th, 21st, 23d, 27th to 31st; lower lake region, 1st to 5th, 8th, 9th, 25th, 28th, 31st; upper lake region, 1st, 2d, 19th, 22d, 23d, 24th, 27th, 28th, 29th, 31st; Upper Mississippi valley, 2d, 3d, 11th, 14th, 20th, 23d, 24th, 25th, 27th, 31st; Missouri valley, 1st, 2d, 3d, 23d to 29th; northern slope, 10th, 22d, 29th, 30th; middle slope, 10th, 25th, 28th, 29th; northern plateau, 1st, 29th, middle plateau, 1st, 2d, 4th, 8th, 10th, 24th; Middle Pacific coast region, 3d, 24th, 26th, 28th; South Pacific coast region, 2d, 3d, 11th. They were also reported from the following stations not included in the districts named above: Eagle Pass, Tex., 3d; Brownsville, Tex., 29th; Moorhead, Minn., 31st; El Paso, Tex., 12th; Florence, Ariz., 11th, 25th; Roseburg, Or., 6th. An exceptionally brilliant display occurred at Northfield, Minn., on the 29th. There were two rings; one around the moon, and the other passing through it. The circle around the moon showed the prismatic colors very distinctly; the other was white.

MIRAGE.

New Haven, 5th, a well defined mirage was observed over Long Island. The Island seemed unusually prominent and above it appeared its inverted image. Indianola, Tex., 8th, 28th. Olivet, Dak., 27th. Northport, Mich., 5th, 3 to 4 p. m.

MISCELLANEOUS PHENOMENA.

METEORS.

Davenport, 12th; Ft. Benton, Mont., 8th; Florence, Ariz., 24th; Yuma, Ariz., 29th; Vevay, Ind., 13th, 31st; Monticello, Ia., 22d; Holton, Kan., 10th; Woodstock, Md., 3d, 12th, 14th, 21st, 22d; Rowe, Mass., 19th; Freehold, N. J., 13th; Rio Vista, Cal., 27th.

POLAR BANDS.

St. Louis, 30th; Florence, Ariz., 13th; Riley, Ill., 29th; New Corydon, Ind., 1st, 3d, 12th, 19th, 23d, 29th 30th; Yates Centre, Kan., 4th, 5th, 11th; Cornish, Me., 26th; Auburn, N. H., 5th, 8th; Atco, N. J. 29th; Wytheville, Va., 3d, 11th, 31st.

EARTHQUAKES.

San Diego, Cal., 11th, about 4 p. m., slight shock, from north to south, of very short duration. San Francisco, 16th, 1.46 p. m., light shock felt in city. Salinas City, Cal., light shocks of earthquakes felt twice during month. Poway, Cal., 11th, 3.30 p. m., slight shock.

SUNSETS.

The characteristics of the sky as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Service stations. Reports from 185 stations show 5,690 observations to have been made, of

which 29 were reported doubtful; of the remainder, 5,661, or 85.3 per cent., were followed by the expected weather.

SUN SPOTS.

The following record of observations has been forwarded by Mr. D. P. Todd, Director of the Lawrence Observatory, Amherst, Mass.:

DATE—Mar., 1882.	No. of new		Disappear'd by solar rotation.		Reappear'd by solar rotation.		Total No. visible.		REMARKS.
	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	
3, 9 a. m...	1	20‡	.....	.....	.....	.....	2	25‡	
4, 11 a. m...	0	0	0	0	0	0	2	25‡	
5, 10 a. m...	2	3	0	0	1	2	4	30‡	
8, 11 a. m...	1	2	.....	.....	1	2	5	30‡	
13, 10 a. m...	3	12	.....	.....	.....	.....	5	20‡	
14, 11 a. m...	1	3	0	0	0	0	6	23‡	
17, 11 a. m...	1	10‡	.....	.....	.....	.....	3	25‡	
18, 8 a. m...	0	5	1	5	0	0	2	20‡	
19, 2 p. m...	2	15	0	0	0	0	4	35‡	
20, 11 a. m...	0	0	0	0	0	0	4	33‡	
22, 3 p. m...	1	2	1	5	1	2	4	30‡	
23, 10 a. m...	0	0	0	0	0	0	4	30‡	
25, 12 m.....	0	0	0	0	0	0	4	30‡	
28, 2 p. m...	0	0	1	10‡	0	0	3	15‡	
29, 11 a. m...	2	5	0	0	1	2	5	20‡	
30, 1 p. m...	2	15‡	1	3	1	5	6	35‡	
31, 8 a. m...	0	0	1	5	0	0	5	30‡	

‡Approximated. Faculæ were seen at the time of every observation.

The following record of observations has been forwarded by Mr. A. G. Bender, Sacramento, Cal.: 2d, 11.30 a. m., one group, twenty spots; this might be regarded as two groups, but they are close together; 3d, 11.30 a. m., one group, twenty spots; two of the smaller spots much enlarged; 4th, 12 m., two groups, thirty spots; one new group, six spots; first group much changed; second group appeared near centre of upper section; 5th, 11.30 a. m., two groups, twenty spots; one group, one spot, reappeared by rotation; the new group seen on 4th, not visible; 6th, 1 p. m., two groups, twenty spots; the first named group continues to change in number and form of spots; 7th, 1 p. m., five groups, twenty-five spots, one new group, two spots appeared near centre of upper section; 8th, 1 p. m., four groups, twelve spots; one new group, one spot; first named group changed to five large and three small spots. 9th, 12 m., four groups, twelve spots; 10th, 11.45 a. m., six groups. thirty-five spots; two new groups, seven spots; one of the earlier groups first showing two spots, now shows ten or more; the new groups appeared one in each section; 11th, 1 p. m., seven groups, thirty-five or forty spots; one group reappeared by rotation; much change in groups since 10th; 12th, six groups, thirty spots; one group, five spots, disappeared by rotation; a little cloudy; 14th, 3.15 p. m., five groups, twenty-five or thirty spots; cloudy, but occasional views show one group, one spot, to have disappeared by rotation; 16th, 11.30 a. m., five groups, ten spots; one new group, three spots; one group, one spot, disappeared by rotation; new group is near one already seen; 17th, 12 m., three groups, fifteen to twenty spots; one group, one spot, disappeared by rotation or became connected by new spots with another; 18th, 12 m., three groups, nine spots; much change in appearance of two groups. 19th, four groups, twenty-five spots; one new group, eight spots, near centre of upper section changing while under observation; 20th, 1 p. m., four groups, thirty-five spots; a large cluster added to the spot which appeared on the 11th; 21st, 1 p. m., four groups, three spots; one group, five spots, disappeared by rotation; one group, one spot, reappeared by rotation; the cluster mentioned on 20th has become dim, except one spot; 22nd, 12.45 p. m., four groups, thirty spots; one new group, three spots; one group, five spots, disappeared by rotation; one new spot near the one that appeared on 21st; new group in left part of lower section, rather dim; cluster seen on 20th, still dim; day a little cloudy; 23rd, 12.30 p. m., six groups, forty to fifty spots; two new groups, ten spots near centre of lower section; 24th, 1.30 p.m., six groups, thirty-five spots; some spots disappeared; 25th, 1.30 p. m., four groups, twenty-five spots; one group disappeared by rotation; group first seen on 22d has also disappeared; 26th, 1 p. m., three groups, twenty spots; one group, five spots disappeared by rotation; some of the spots also disappeared; 27th, 12 m., four groups, twenty spots; one new group, two spots, appeared to the right of centre of upper section; 28th, 1.15 p. m., three groups, ten spots; one group, two spots, disappeared by rotation, 29th, 12 m., three groups, three spots; one new group, one spot, possibly appeared by rotation; one group, seven spots, disappeared by rotation; 30th, 1.30 p. m., two groups, six spots; some new spots appear near a former single one; one group, one spot, disappeared by rotation; 31st, 12 m., two groups, six spots. Mr. William Dawson, at Spiceland, Ind., reports: 1st, two groups, seven spots, one large spot, 4′ from east edge; 2d, two groups, twenty spots; 5th, four groups, thirty-five spots; large group of thirty spots, west of centre and one large spot near east edge; 15th, six groups, twenty spots, five of them large; 19th, four groups, sixty spots; one large spot 8′ from east edge; 31st, seven groups, thirty spots; the large spot nearing the west edge has nearly or quite divided into two. Mr. David Trowbridge, at Waterburg, N. Y., reports: 2d, one group, three spots; 3d, one group, (same as on 2d,) six spots; 4th, two groups, eight spots; a new group has arisen near middle of disk; 8th, four groups, eight spots; 11th, six groups, seven spots; one group has just appeared by rotation; 17th, three groups, five spots; 19th, three groups, (same as 17th,) ten large spots; 20th, four groups, eleven spots; 29th, five groups, five spots, all faint but one; one group appeared by rotation. Mr. H. D. Gowey, at North Lewisburg, Ohio, reports: sun spots were observed on every clear day during the month. They were most numerous on the 10th, and least numerous on the 1st; largest on the 26th, and smallest on the 31st.

SAND STORMS.

Leavenworth, 21st; Fort Cummins, N. Mex., 24th; San Carlos, Ariz., 17th, 22d, 27th, 28th; Tucson, Ariz, 3d; Yuma, Ariz., 3d, 6th, 7th, 25th; Camp Thomas, Ariz., 3d, 5th, 13th, 17th, 22d, 25th; Umatilla, Or., 24th to 28th; on the latter date, trains were delayed on account of the track being covered with sand. Fort Garland, Col., 17th. St. Louis, Missouri Weather service reports: during heavy gale which covered the state on 21st, a marked dust storm was reported from Greenfield, Clinton, Harrisonville, Pleasant Hill, Lexington and Savannah, in the western part of the state.

PRAIRIE AND FOREST FIRES.

Ft. Gibson, Ind. Ty., 12th, 15th, 18th, 25th. Omaha, 3d, 28th; that of the latter date was very disastrous. In Sarpy county, barns, corn-cribs, stock and other property were destroyed. A man in attempting to rescue a team was fatally burned. Yankton, 10th, 15th, 17th, 22d, 28th, 31st. Terry's Landing, Mont., 22d. Ft. Supply, Ind. Ty., 4th, 14th. Dodge City, Kan., 22d, 28th. Pike's Peak, 14th, 15th. Ft. Bayard, N. Mex., 30th. Yates Centre, Kan., 2d. Council Grove, Kan., 16th. Protem, Mo., 15th, 16th, 21st, 22d. Lincoln, Neb., 25th. Fayetteville, N. C., 25th. North Platte, Neb., 14th, 25th. Alexandria, Dak., 27th, 28th.

ZODIACAL LIGHT.

New Haven, 7th, 8th; Cedar Keys, Fla., 7th, 20th; Punta Rassa, Fla., 9th; Nashville, 9th, 10th, 13th, 15th, 18th, 19th; St. Vincent, Minn., 8th; Springfield, Ill., 13th; New Corydon, Ind., 12th, 13th; Clinton, Iowa, 12th, 13th; Monticello, Iowa, 13th, 18th; Yates Centre, Kan., 10th, 12th, 14th; Cornish, Me., 7th, 8th, 13th, 14th; Orono, Me., 7th, 8th; Harvard College, Cambridge, Mass., suspected, 15th, 20th, 24th, 25th; distinct, 8th, 11th, 13th, 14th, 17th, 19th, 25th; Somerset, Mass., 8th, 11th, 19th; Williamstown, Mass., 17th, 19th; Fall River, Mass., 18th, 19th; Rowe, Mass., 14th, 19th; Fayetteville, N. C., 11th, 12th, 13th; Albany, Or., 10th; Dyberry, Pa., 8th.

MIGRATION OF BIRDS.

Geese flying southward: Indianola, 12th; Port Huron, 30th; Yankton, Dak, 17th, 19th; Charleston, Ill., 5th. *Geese flying northward:* Alexandria, Dak., 16th; Indianola, 2d; Champaign, Ill., 5th; Bismarck, Dak., 30th, 31st; Dubuque, 2d; Des Moines, 18th; Davenport, 4th; Yankton, Dak., 21st, 22d, 26th; Leavenworth, 16th; Cheyenne, Wyo., 2d; Terry's Landing, Mont., 16th; Ft. Assinnaboine, Mont., 31st; Portland, Or., 10th; Ft. Hale, Dak, 16th; Logansport, Ind., 5th; Monticello, Ia., 17th; Cedar Rapids, Ia., 1st; Protem, Mo., 1st; Palermo, N. Y., 20th; Wellsboro, Pa., 5th. *Ducks flying southward:* Indianola, 13th; Port Huron, 18th; Yankton, Dak., 19th; Charleston, Ill., 5th. *Ducks flying northward:* Alexandria, Dak., 16th; Ft. Macon, N. C., 12th; Detroit, Mich., 5th to 8th; Toledo, 2d; Dubuque, 2d; Yankton, Dak., 22d, 26th; Charleston, Ill., 23d; Monticello, Ia., 5th, 27th; Des Moines, 17th; Northfield, Minn., 10th. *Cranes flying northward:* Ft. Gibson, Ind. Ty., 18th; Charleston, Ill., 15th; Nora Springs, Ia., 29th; Des Moines, Ia., 1st, 17th; Fayette, Miss., 14th; Protem, Mo., 19th; Murfreesboro, Tenn., 9th, 10th. *Sand hills flying northward:* Ft. Gibson, Ind. Ty., 18th. *Pigeons flying northward:* Monticello, Ia., 5th, 27th.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR:

W. B. HAZEN,
Brig. & Bvt. Maj. Gen'l,
Chief Signal Officer, U. S. A.

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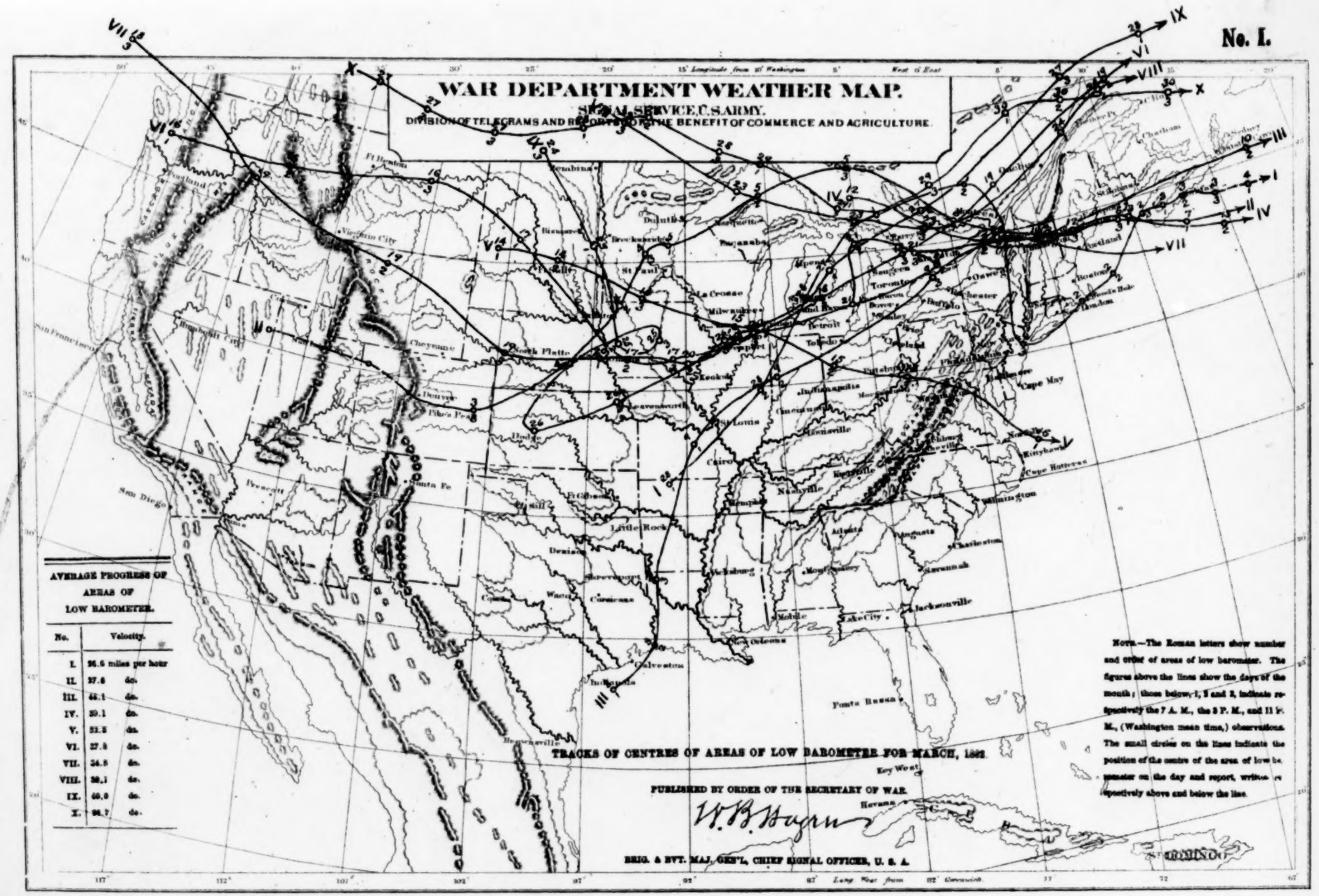
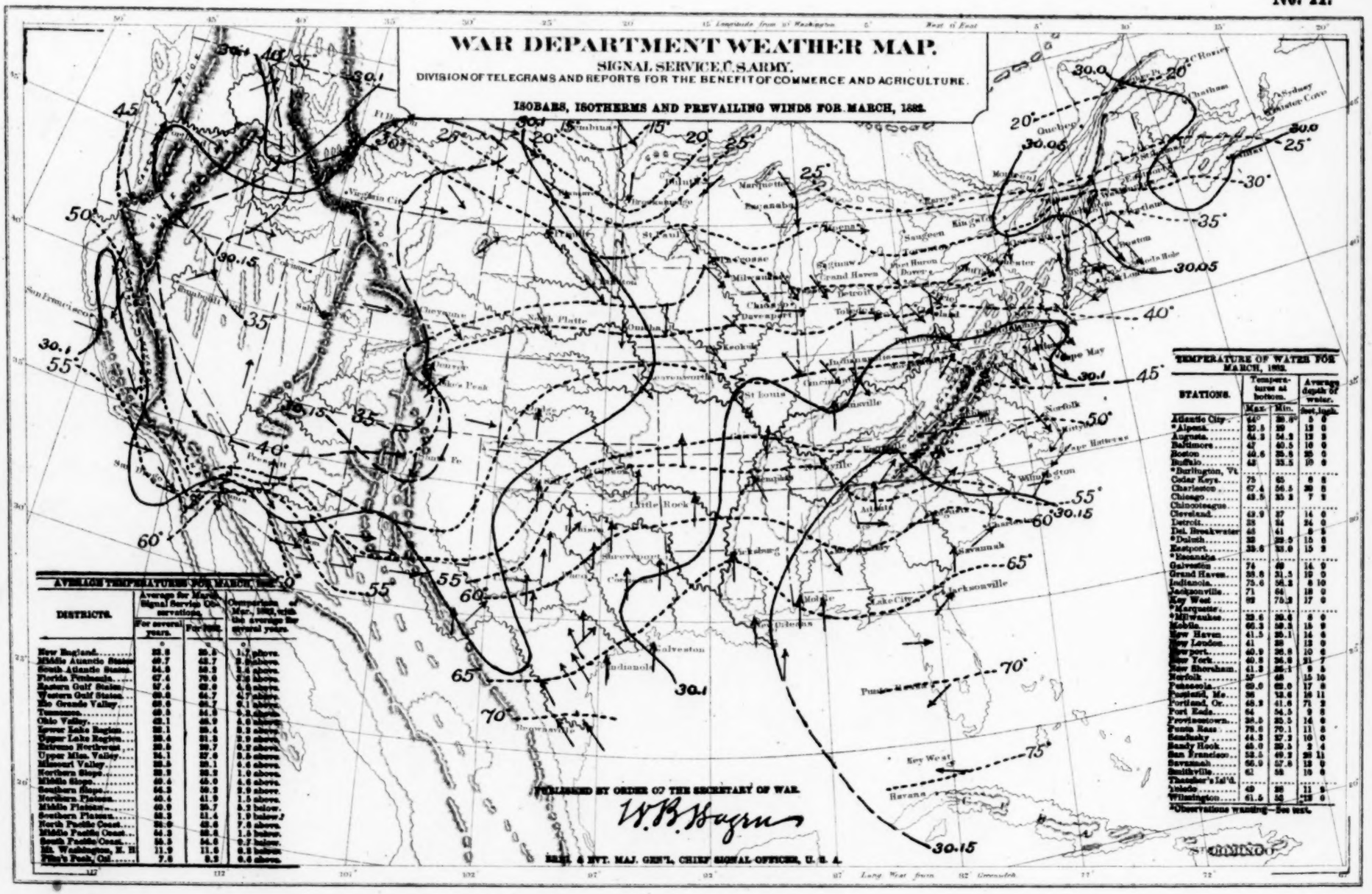
No. I.


WAR DEPARTMENT WEATHER MAP.
SIGNAL SERVICE U.S.ARMY.
DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.
AVERAGE PROGRESS OF AREAS OF LOW BAROMETER.
No. | Velocity.
I. 26.6 miles per hour
II. 27.6 do.
III. 44.1 do.
IV. 29.1 do.
V. 21.5 do.
VI. 27.5 do.
VII. 34.5 do.
VIII. 38.1 do.
IX. 40.0 do.
X. 26.7 do.
TRACKS OF CENTRES OF AREAS OF LOW BAROMETER FOR MARCH, 1872.
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
W. B. Hazen
BRIG. & BVT. MAJ. GEN'L, CHIEF SIGNAL OFFICER, U. S. A.
Note.—The Roman letters show number and order of areas of low barometer. The figures above the lines show the days of the month; those below, 1, 2 and 3, indicate respectively the 7 A. M., the 2 P. M., and 11 P. M., (Washington mean time,) observations. The small circles on the lines indicate the position of the centre of the area of low barometer on the day and report, written respectively above and below the line.

No. II.


WAR DEPARTMENT WEATHER MAP.
SIGNAL SERVICE, U.S.ARMY.
DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.
ISOBARS, ISOTHERMS AND PREVAILING WINDS FOR MARCH, 1882.
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
W. B. Hazen
BRIG. & BVT. MAJ. GEN'L, CHIEF SIGNAL OFFICER, U. S. A.

AVERAGE TEMPERATURES FOR MARCH, 1882.

DISTRICTS.	Average for March Signal Service Observations. For several years.	For 1882.	Comparison Mar., 1882, with the average for several years.
	°	°	
New England	32.9	29.8	3.1° above.
Middle Atlantic States	40.7	42.7	2.0 above.
South Atlantic States	54.0	55.3	1.3 above.
Florida Peninsula	67.4	70.0	2.6 above.
Eastern Gulf States	57.4	62.0	4.6 above.
Western Gulf States	59.0	64.7	5.7 above.
Rio Grande Valley	69.0	69.7	0.7 above.
Tennessee	49.5	51.8	2.3 above.
Ohio Valley	42.1	46.9	4.8 above.
Lower Lake Region	32.1	33.4	1.3 above.
Upper Lake Region	29.4	31.3	1.9 above.
Extreme Northwest	23.1	23.7	0.6 above.
Upper Miss. Valley	34.1	37.6	3.5 above.
Missouri Valley	32.5	38.1	5.6 above.
Northern Slope	32.5	33.5	1.0 above.
Middle Slope	40.4	45.0	4.6 above.
Southern Slope	54.3	59.2	2.9 above.
Northern Plateau	40.4	41.9	1.5 above.
Middle Plateau	40.9	39.7	0.7 below.
Southern Plateau	32.3	31.4	1.9 below.
North Pacific Coast	52.0	45.6	7.6 above.
Middle Pacific Coast	54.3	52.8	1.5 below.
South Pacific Coast	59.5	54.8	0.7 below.
Mt. Washington, N. H.	11.9	11.6	0.3 below.
Pike's Peak, Col.	7.6	8.2	0.6 above.

TEMPERATURE OF WATER FOR MARCH, 1882.

STATIONS.	Temperatures at bottom. Max.	Min.	Average depth of water. Feet. Inch.
Atlantic City	44°	39.0°	5 0
*Alpena	32.5	29	13 0
Augusta	54.3	54.3	12 0
Baltimore	47	40.5	10 0
Boston	40.6	39.6	25 0
Buffalo	44	33.5	10 0
*Burlington, Vt.			
Cedar Keys	73	68	3 0
Charleston	67.4	56.5	20 0
Chicago	43.5	33.3	7 0
Chincoteague			
Cleveland	43.9	37	14 0
Detroit	38	34	24 0
Del. Breakwater	46	41	8 0
*Duluth	32	32.9	15 0
Eastport	38.6	33.0	15 0
*Escanaba			
Galveston	74	49	14 0
Grand Haven	38.6	31.5	10 0
Indianola	75.6	54.2	3 10
Jacksonville	71	64	13 0
Key West	82	75.2	17 0
*Marquette			
*Milwaukee	33.6	30.6	8 0
Mobile	66.3	49.3	15 0
New Haven	41.5	39.1	14 0
New London	41	39	13 0
Newport	40.9	36.6	10 0
New York	40.8	36.6	21 7
New Shoreham	41.8	36.1	9 6
Norfolk	57	48	15 10
Pensacola	69.0	62.0	17 0
Portland, Me.	36	33.6	18 11
Portland, Or.	48.2	41.6	71 2
Port Eads	64	54.5	9 6
Provincetown	36.5	35.5	14 0
Punta Rassa	78.6	70.1	11 8
Sandusky	44.3	37.2	10 0
Sandy Hook	40.0	39.5	9 4
San Francisco	52.5	49.3	26 11
Savannah	56.0	57.6	13 0
Smithville	62	55	10 0
Thatcher's Isl'd.			
Toledo	49	39	11 0
Wilmington	61.5	55	23 0

*Observations wanting—Ice out.

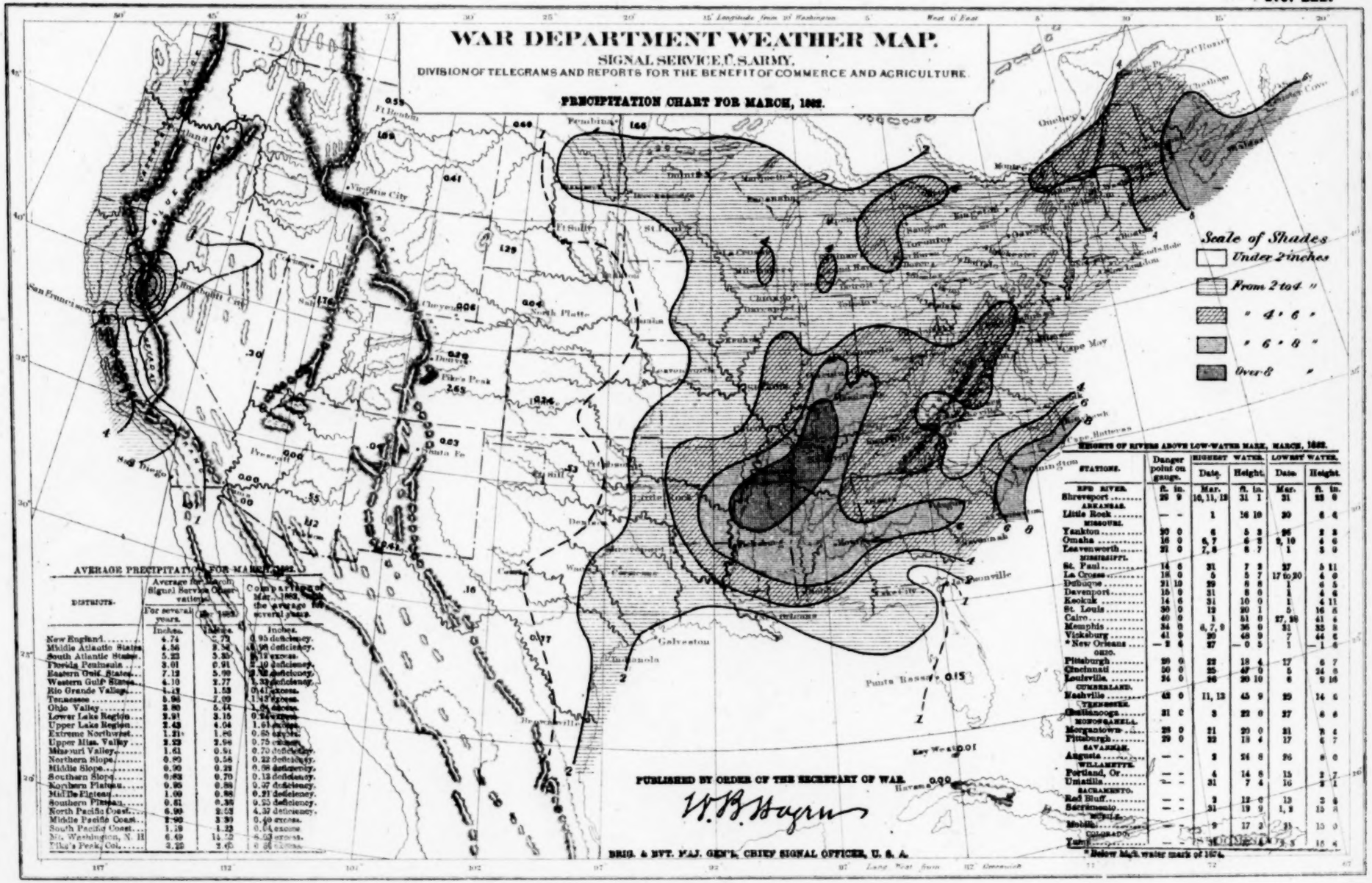
No. III.

WAR DEPARTMENT WEATHER MAP.

SIGNAL SERVICE, U. S. ARMY.

DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

PRECIPITATION CHART FOR MARCH, 1882.



AVERAGE PRECIPITATION FOR MARCH, 1882.

DISTRICTS.	Average for March (Signal Service Observations). For several years.	Average for March, 1882.	Column 3 minus Column 2. Departure of March, 1882, from the average for several years.
	Inches.	Inches.	Inches.
New England	4.74	3.79	0.95 deficiency.
Middle Atlantic States	4.56	3.58	0.98 deficiency.
South Atlantic States	5.23	5.35	0.12 excess.
Florida Peninsula	3.01	0.91	2.10 deficiency.
Eastern Gulf States	7.12	5.99	1.13 deficiency.
Western Gulf States	4.10	2.77	1.33 deficiency.
Rio Grande Valley	1.41	1.53	0.12 excess.
Tennessee	5.96	7.09	1.13 excess.
Ohio Valley	3.80	5.44	1.64 excess.
Lower Lake Region	2.91	3.15	0.24 excess.
Upper Lake Region	2.43	4.04	1.61 excess.
Extreme Northwest	1.21	1.89	0.68 excess.
Upper Miss. Valley	2.23	2.98	0.75 excess.
Missouri Valley	1.61	0.91	0.70 deficiency.
Northern Slope	0.89	0.56	0.33 deficiency.
Middle Slope	0.90	0.28	0.62 deficiency.
Southern Slope	0.83	0.70	0.13 deficiency.
Northern Plateau	0.95	0.88	0.07 deficiency.
Middle Plateau	1.00	0.88	0.21 deficiency.
Southern Plateau	0.61	0.36	0.25 deficiency.
North Pacific Coast	6.90	2.53	4.37 deficiency.
Middle Pacific Coast	2.95	3.39	0.44 excess.
South Pacific Coast	1.19	1.23	0.04 excess.
Mt. Washington, N. H.	6.49	14.72	8.23 excess.
Pike's Peak, Col.	2.23	2.45	0.22 excess.

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BRIG. & BVT. MAJ. GEN'L, CHIEF SIGNAL OFFICER, U. S. A.

HEIGHTS OF RIVERS ABOVE LOW-WATER MARK, MARCH, 1882.

STATIONS.	Danger point on gauge.	HIGHEST WATER. Date.	HIGHEST WATER. Height.	LOWEST WATER. Date.	LOWEST WATER. Height.
	ft. in.	Mar.	ft. in.	Mar.	ft. in.
RED RIVER.					
Shreveport	20 9	10, 11, 12	31 1	31	13 6
ARKANSAS.					
Little Rock	— —	1	16 10	30	6 6
MISSOURI.					
Yankton	20 0	6	5 3	26	2 3
Omaha	16 0	6, 7	6 2	2, 10	4 6
Leavenworth	21 0	7, 8	8 7	1	3 0
MISSISSIPPI.					
St. Paul	14 6	31	7 2	27	5 11
La Crosse	18 0	5	5 7	17 to 20	4 0
Dubuque	21 10	29	8 8	1	6 5
Davenport	15 0	31	8 0	1	4 6
Keokuk	14 6	31	10 0	1	4 11
St. Louis	30 0	12	20 1	9	16 6
Cairo	40 0	1	51 0	27, 28	41 4
Memphis	34 0	6, 7, 8	36 0	31	32 3
Vicksburg	41 0	20	48 9	7	44 6
* New Orleans	— 2 6	27	— 0 5	1	— 1 6
OHIO.					
Pittsburgh	20 0	22	19 4	17	6 7
Cincinnati	50 0	25	47 0	5	24 8
Louisville	24 0	26	30 10	6	9 10
CUMBERLAND.					
Nashville	45 0	11, 13	45 9	29	14 6
TENNESSEE.					
Chattanooga	31 6	3	22 6	27	6 6
MONONGAHELA.					
Morgantown	28 0	21	20 0	31	7 4
Pittsburgh	29 0	22	19 4	17	6 7
SAVANNAH.					
Augusta	— —	2	24 8	26	8 0
WILLAMETTE.					
Portland, Or	— —	4	14 6	15	2 7
Umatilla	— —	31	7 4	16	2 1
SACRAMENTO.					
Red Bluff	— —	2	12 6	13	3 6
Sacramento	— —	31	19 9	1, 2	13 8
MOBILE.					
Mobile	— —	9	17 2	31	15 0
COLORADO.					
Yuma	— —	31	14 3	5	10 4

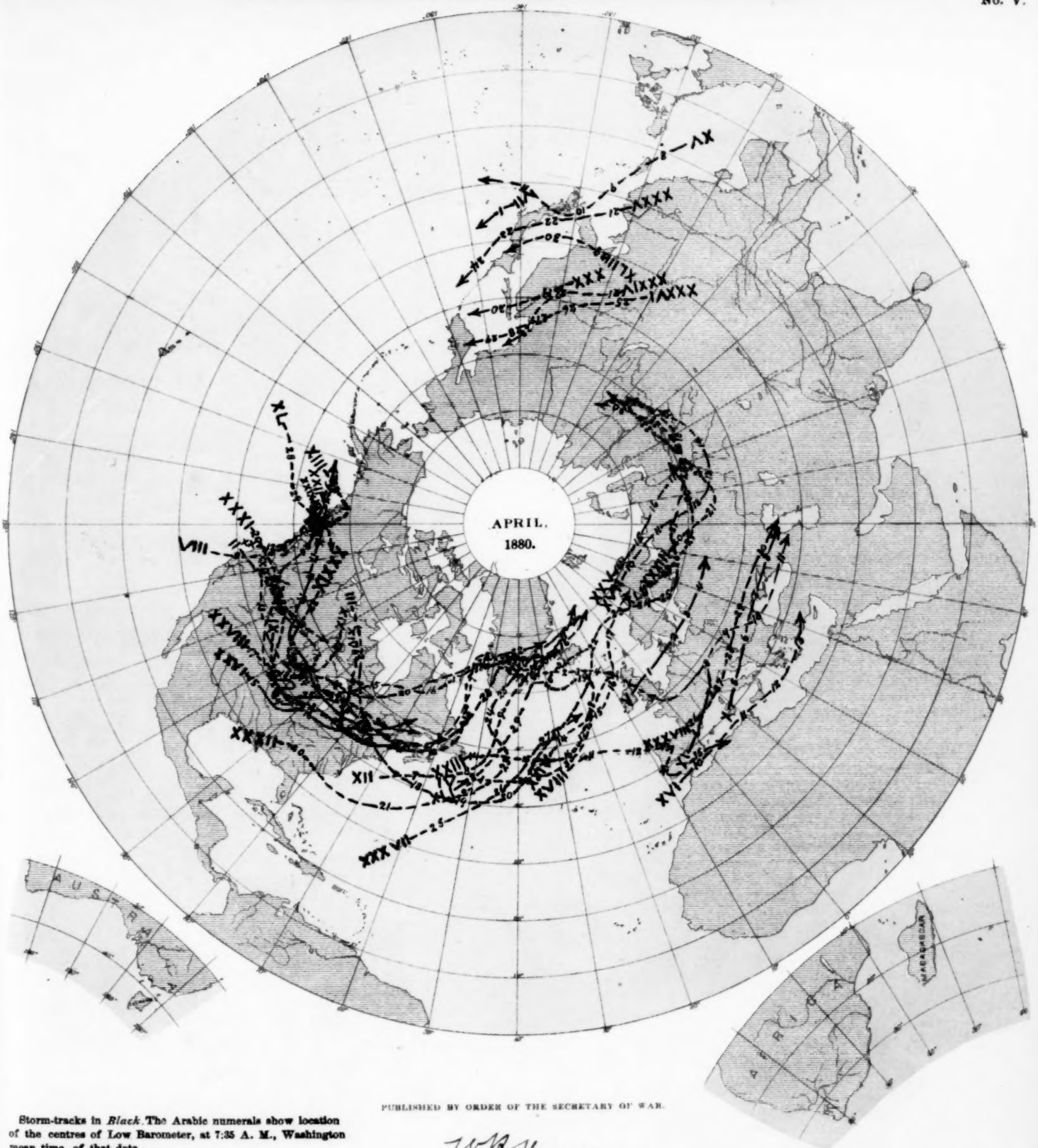
* Below high water mark of 1874.

Office of the Chief Signal Officer,

UNITED STATES ARMY.

Charted from Actual Observations taken Simultaneously, Series commencing November, 1877.

No. V.



Storm-tracks in *Black*. The Arabic numerals show location of the centres of Low Barometer, at 7:35 A. M., Washington mean time, of that date.

Broken or dotted lines, are doubtful.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

W. B. Hazen

BRIG. & BVT. MAJ. GEN'L.
CHIEF SIGNAL OFFICER U. S. A.

INTERNATIONAL CHART.

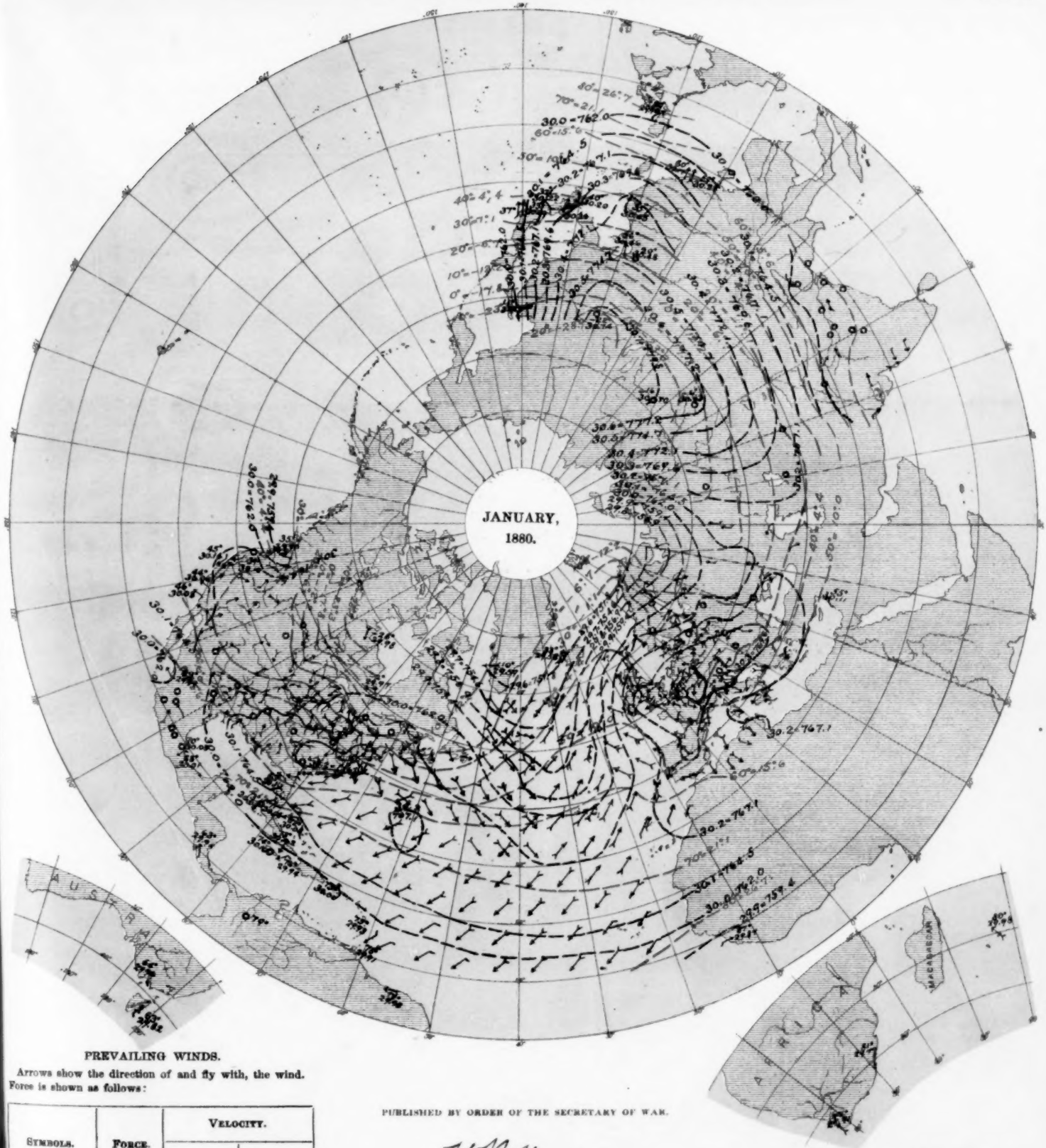
Showing Tracks of Centres of Low Barometer for April, 1880.

Office of the Chief Signal Officer,

UNITED STATES ARMY.

Charted from Actual Observations taken Simultaneously, Series commencing January, 1877.

No. IV.



PREVAILING WINDS.

Arrows show the direction of and fly with, the wind.
Force is shown as follows:

Symbols.	Force.	Velocity.	
		Miles per hour.	Metres per second.
O	0	0	0
→	1, 2	0 to 9	0 to 4.0
→	3, 4	9.1 to 22.5	4.1 to 10.1
→	5, 6	22.6 to 40.5	10.1 to 18.1
→	7, 8	40.6 to 67.5	18.1 to 30.2
→	9, 10	67.6 up.	30.2 & over.

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BRIG. & BVT. MAJ. GEN'L,
CHIEF SIGNAL OFFICER, U. S. A.

ISOBARS AND ISOTHERMS.

Isobars in *black*; detached barometer means in English inches.

Isotherms in *red*; detached temperature means in degrees Fahrenheit.

Broken lines, are doubtful.

INTERNATIONAL MONTHLY CHART.

Showing mean pressure, mean temperature, mean force and prevailing direction of winds at 7:35 A. M., Washington mean time, for the month of January, 1880, based on the daily charts of the International Bulletin.